THE HEATING AND VENTILATING MAGAZINE

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Operation of Large Federal Buildings in Washington

With Detailed Data for the District Building, Washington Post-Office and the National Museum Group.

By NELSON S. THOMPSON.

Presented at the recent annual convention of the National District Heating Association.

It is regretted that existing conditions render it undesirable for the writer to give the full engineering data in connection with the Central Heating, Lighting and Power Plant designed to serve twenty-one of the most important Federal buildings in the City of Washington, D. C. At a later date it is hoped that the full and complete data may be submitted to the Association for criticism.

At this time I can only describe an interesting part of the problem in designing this plant—that of determining the operating characteristics of the completed and occupied buildings, and predicting the operating characteristics of the buildings under construction, in line with the writer's practice for Federal buildings.

The estimated amounts of steam used by the occupied buildings were determined from the amount of coal used in each building on the basis of an evaporation of 8.62 lbs. of water per pound of bituminous coal, or 6.38 lbs. of water per pound of anthracite coal (mostly pea coal). These evaporation figures were obtained as the result of trials on a given set of boilers, extending over a period of two weeks, one on a set of boilers equipped for burning anthracite, and one on a set of boilers equipped for burning bituminous coal.

Car-mile recorders were used on the elevators, and revolution counters on the elevator pumps.

The amount of electric current was readily obtainable in each case from the building records.

ESTIMATING THE OPERATING CHARACTERISTICS.

The operating characteristics of the uncompleted buildings were estimated, in accordance with the practice of the writer, as follows:

The total cubic contents of the average Federal building multiplied by four is assumed to equal the total pounds of steam per annum for heating and ventilating the building.

The average demand for steam per hour for heating and ventilating equals the annual consumption divided by 5,000.

The maximum demand for steam per hour for heating and ventilating is 2½ times the average demand.

If the heating surface is known, the

blast coils are reduced to equivalent direct radiation by multiplying the square feet of heating surface in blast coils by 3; and after all surface is reduced to equivalent direct steam radiation, to ascertain the total steam required per annum, the number of square feet equivalent direct steam radiation is multiplied by 500. This is used as a check on the first assumption, and the mean of the two quantities is generally taken.

Gravity indirect water or steam radiation is reduced to equivalent direct water or steam radiation, as the case may be, by multiplying by 1½.

To reduce direct hot water to direct steam equivalent, it is divided by 1.6.

Car miles per day for each elevator in an ordinary small Federal building are taken at 5; while in the large buildings of six or eight stories, in places like New York and Philadelphia, and in the Departments at Washington, each passenger elevator will average 10 car miles per day.

Kilowatt-hours per car mile for electric elevators equal 5.

Steam per car mile for hydraulic elevators operated by compound duplex steam pumps equals 1,000 lbs., while for high-duty pumps it amounts to 650 lbs.

Steam per annum used for heating water for sanitary purposes is 10% of the total steam used for heating and ventilating the building.

For a post-office building (a 24-hour activity), the annual current consumption in a modern large Federal building will average 2½ kw-hr. per square foot of total floor area; while in a large modern Federal building of eight-hour activity it will average 1¼ kw-hr. per square foot.

In Federal buildings of 1,000,000 ft. cubic contents or smaller, with 24-hour service and electric elevators, the current consumption per annum will average 0.8 kw-hr. per square foot total floor area.

The average demand for electric power and light will be the total annual consumption divided by 8,760, and the maximum demand will be 2½ times the average demand in a 24-hour building, and 4 times the average in an 8-hour building.

If an electric generating plant is installed in a building, using high-grade 4-valve engines, 50 lbs. of steam is allowed for each kw-hr. generated, on the switch-board, with no allowance for the exhaust into the heating system. This is done to cover fully all the losses which are incident to a modern small plant.

To reduce the pounds of steam to coal, as previously indicated (covering all losses in the plant), an average evaporation of 8 to 1 is assumed for bituminous coal, and 6 to 1 for anthracite pea or buckwheat coal.

Boiler room repairs, $1 per h.p. of nominal boiler h.p. rating.

Engine room repairs, $1 per kw. of nominal total kw. rating of generators.

Boiler and engine room supplies, $2 per kw. of rating of generators installed with a generating plant.

Boiler room labor averages $2 per ton of coal fired, which is based on 8-hour shifts and an average wage per day of $2.50 for each fireman. In the smallest generating plants one chief engineer at $1,400 and three assistant engineers at $1,200 each per annum must be provided, and in the larger plants the salaries are increased and additional labor supplied.

The labor in a Federal building containing an electric generating plant will roughly average the same as the cost of the coal, supplies and repairs to the boilers and electric generating plant.

The fixed charges are those sanctioned by the Bureau of Standards for machinery in Federal buildings; *i .e.*, 3% interest and 5% depreciation per annum on engines, boilers, etc.; while on buildings, tunnels, seawalls, cables, etc., 2% depreciation per annum is allowed.

The annual dividend which must be earned by the ordinary isolated plant in comparison with the purchase of current from a public utility is 6% on the cost of the Government plant.

STEAM CONSUMPTION FOR HEATING IN EIGHTEEN LARGE BUILDINGS.

From the records of eighteen large buildings scattered over the entire United States, it is found that the average of the steam consumption per month for heating is as follows:

October	6%
November	11%
December	18%
January	18%
February	18%
March	15%
April	10%
May	4%
	100%

The application of the foregoing data to a few of the buildings to be served by the Central Heating, Lighting and Power Plant, and to one where steam and electricity are now purchased, will show that the approximations noted are fairly accurate:

DISTRICT BUILDING, WASHINGTON, D. C.

Contents, 4,600,000 cu. ft.

A small portion of the building is used 24 hours a day for police headquarters.

Building is equipped with electric generators, and all fans, etc., are electrically operated.

Kw-hr. generated per annum in the isolated electric plant, 436,000.

Total square feet floor area, 325,000.

4,600,000 multiplied by 4 equals 18,400,000 lbs. steam for heating and ventilating on cubic contents basis.

40,000 multiplied by 500 equals 20,000,000 lbs. steam for heating and ventilation on equivalent direct steam radiation basis.

Average of the two foregoing items equals 19,200,000 lbs. steam for heating and ventilating.

436,000 multiplied by 50 equals 21,800,000 lbs. steam used to generate electricity.

Steam for heating water for sanitary purposes is 10% of 19,200,000, or 1,920,000 lbs.

Total steam for all purposes, 42,920,000 lbs.

The survey shows 38,617,000 lbs. based on coal actually burned, using the evaporation factor of 8 to 1.

Maximum demand for steam for heating 21,120,000 divided by 5,000 multiplied by 2½, equals 10,000 lbs.

Maximum demand for electricity, 436,000 divided by 8,760, multiplied by 4, equals 200 kw.

200 kw. multiplied by 50 equals 10,000 lbs. steam, less 20% for condensation, or 8,000 lbs. available for heating, so that the boiler must generate 2,000 lbs. more to heat the building, or 12,000 lbs. per hour for electricity and heating.

12,000 divided by 30 equals 400 h.p. maximum demand on boilers, which is close to the rule of Arthur Williams, of the New York Edison Company, of 1 boiler h.p. per 10,000 cu. ft. of building.

Total coal burned (bituminous), 42,920,000 divided by 8, multiplied by 2,240, equals 2,400 long tons.

The coal actually burned was 2,010 long tons.

Total floor area, 325,000 multiplied by 1¼, equals 406,000 kw-hr.

Average demand, 406,000 divided by 8,760, equals 46 kw.

Maximum demand, 46 multiplied by 4, equals 184 kw.

There was actually used in the building 436,000 kw-hr. per annum.

The measured average demand was 50 kw.

The measured maximum demand was 222 kw., with a maximum surge of 300 kw. due to electric elevators.

WASHINGTON (D. C.) POST OFFICE (NEW).

(Not in the Central Power Plant group, but is served with steam and electricity from the Government Printing Office, about 600 ft. distant.)

Total square feet floor area, 327,000.

Contents, 5,860,000 cu. ft.

Square feet direct steam radiation 27,000.

Steam and electricity supplied from the Government Printing Office.

Square feet in cooling coils used to cool condensation before discharging same to sewer, located under preheating coils, 2,500.

Square feet of steam blast coils, "Vento," 11,000.

Cubic feet in building per square foot steam radiation of all kinds, 150.

Cubic feet in building per square foot equivalent direct steam radiation, on basis of blast coils multiplied by 3 equals direct radiation, and without cooling coils, 98.

All elevators and other machinery are electrically operated.

Equivalent direct steam radiation, 60,000 multiplied by 500 (pounds per square foot per season) equals 30,000,000 lbs. steam per annum, plus 10% for heating water for sanitary purposes, equals 32,000,000 lbs.

The average demand would be 33,000,000 divided by 5,000, or 6,600 lbs. per hour.

The maximum demand would be 6,600 multiplied by 2½ equals 16,500 lbs., or 550 boiler h.p., or 1 to 10,000 cu. ft. of contents.

Using the rule for cubic contents only, the steam used per annum would be 5,860,000 multiplied by 4 equals 23,440,000, plus 10% for water heating, equals 25,784,000 lbs.

Average demand would be 25,784,000 divided by 5,000, or 5,100 lbs.

Maximum demand would be 5,100 multiplied by 2½, or 12,800 lbs.

12,800 lbs. per hour equals 430 boiler h.p.

The actual maximum measured demand for steam was 11,000 lbs. per hour in January.

The actual steam-flow meter readings were as follows:

Total annual consumption of steam, 33,580,000 lbs.

Average demand, 6,700 lbs.

Maximum demand (in 1915 and 1916), 11,000 lbs.

Boiler h.p. (maximum), 367.

Floor area in square feet, 327,000 multiplied by 2½ equals 817,500 kw-hr. per annum.

Average demand, 817,500 divided by 8,760, equals 92 kw.

Maximum demand, 92 multiplied by 2½, equals 220 kw.

The meter readings show 946,613 kw-hr. actually consumed in 1916; average, 108 kw.; maximum, 288 kw.

The building has a full connected load of 2 watts per square foot floor area, and uses the full connected load, 1,500 hours during the year, and the maximum demand 3,300 hours.

The maximum demand is 44% of the full connected load, which is unusually high, due to a large amount of machinery being used in this building.

NATIONAL MUSEUM GROUP.

(Consisting of the new and old National Museum buildings, and the Smithsonian Institution building, all of which are now served from a central plant in New National Museum.)

Total contents, 16,000,000 cu. ft.

Total floor area, 570,000 sq. ft.

Total equivalent direct steam radiation, 72,500 sq. ft.

Ratio of direct steam radiation to cubic contents, approximately 450 to 1, which is very high, but not unusual with the type of building under consideration.

All elevators are electrically operated.

Total steam per annum, by the rule, would be 16,000,000 multiplied by 4, equals 64,000,000 lbs., for heating and ventilating, plus 10% for water heating for sanitary purposes, equals 70,400,000 lbs., which is away out of line on monumental buildings of this class, and will not be considered.

Total steam per annum by the radiation basis would be 72,500 multiplied by 500, equals 36,250,000 lbs. per annum, plus 10% for heating water for sanitary purposes, equals approximately 40,000,000 lbs.

The electric generating plant produces

400,000 kw-hr. per annum, which, multiplied by 50, equals 20,000,000 lbs. of steam for this service.

Total steam generated, 60,000,000 lbs.

The maximum demand for steam heating and ventilating equals 40,000,000 divided by 5,000 multiplied by 2½, or 20,000 lbs.

The maximum demand for steam for electric generating would be 400,000 divided by 8,760, multiplied by 4, multiplied by 50, equals 9,200 lbs. per hour.

The amount of exhaust steam losses in going to the heat apparatus is 20% of 9,200, or approximately 1,800 lbs.; so that the actual maximum demand on the boilers is 21,800, and the horsepower is 700, which upsets the ordinary rules of Arthur Williams and others when applied to buildings of this peculiar character.

The survey showed that there was actually burned per annum 3,000 long tons of bituminous coal, which, at an evaporation of 8 to 1, equals 53,760,000 lbs. of steam per annum.

The maximum hourly amount of coal burned was 2,240 lbs., which equals 17,920 lbs. of steam, and the reading on the steam-flow meter was 22,500 lbs.

The ratio of total floor area to kw-hr. generated per annum is very low, as might be expected; *i.e.*, 570,000 sq. ft. to 400,000 kw-hr., or approximately .7 kw-hr. per square foot of floor area.

The survey showed a maximum demand of 300 kw., which is out of line with the rule, 400,000 divided by 8,760 multiplied by 4, or 184 kw., due to the fact that practically the entire connected load of the largest building is used at certain intervals during lectures, etc.

The smaller buildings in the group follow the writer's approximation very closely, as they fall into the typical office-building class.

The Heating and Power Plant of a Modern Industrial Building

Features of Equipment in Factory of Phœnix-Hermetic Co., Brooklyn, N. Y.

By H. S.

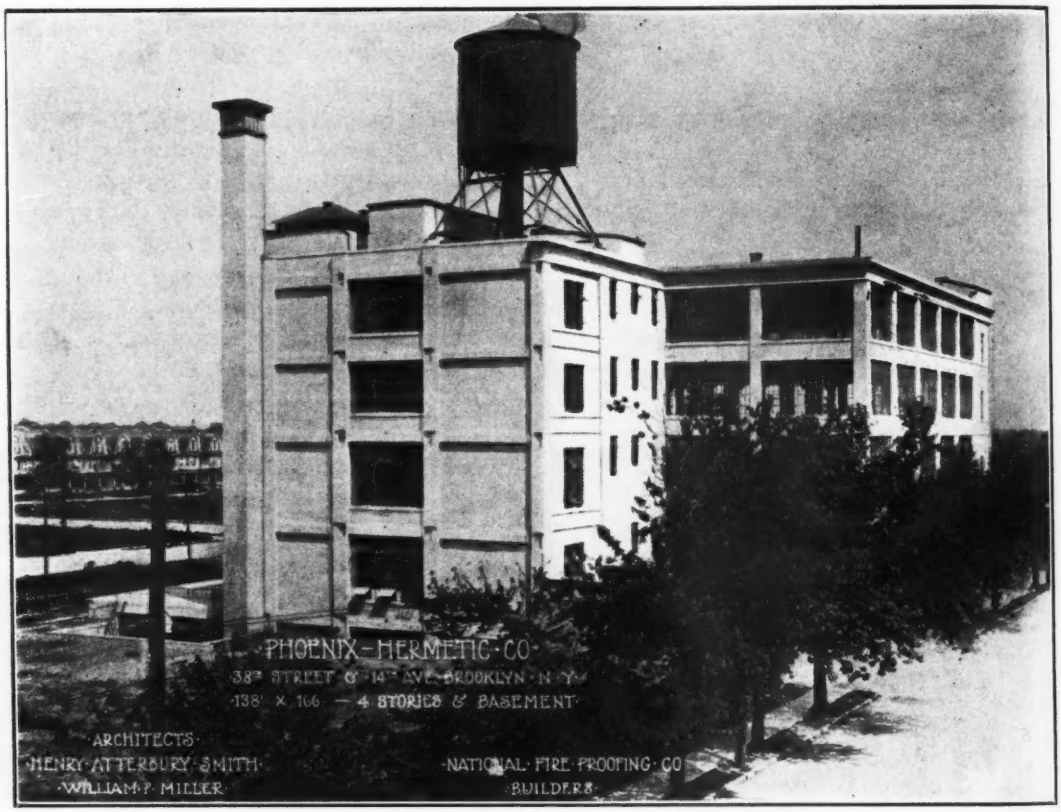
The heating system and power plant of the Phœnix-Hermetic Co. at Thirty-eighth Street and Fourteenth Ave., Brooklyn, N. Y., have many features which differ greatly from most buildings of this type. Gas, generated in the basement by means of a gas producer, is used to run a 100 h.p. gas engine and is also used in high-temperature ovens on the top floor to produce heat for baking japanned products. All the water for the building is supplied by pumps from a well, sunk in the boiler room. Down-draft smokeless boilers are used to generate steam for the heating system, while a small, vertical, high-pressure boiler supplies steam to the producer. This building is four stories high with basement, and is built of reinforced concrete. It is exposed on all four sides. The building was designed by H. Atterbury Smith and William P. Miller, architects.

GAS POWER USED TO GENERATE ELECTRICITY.

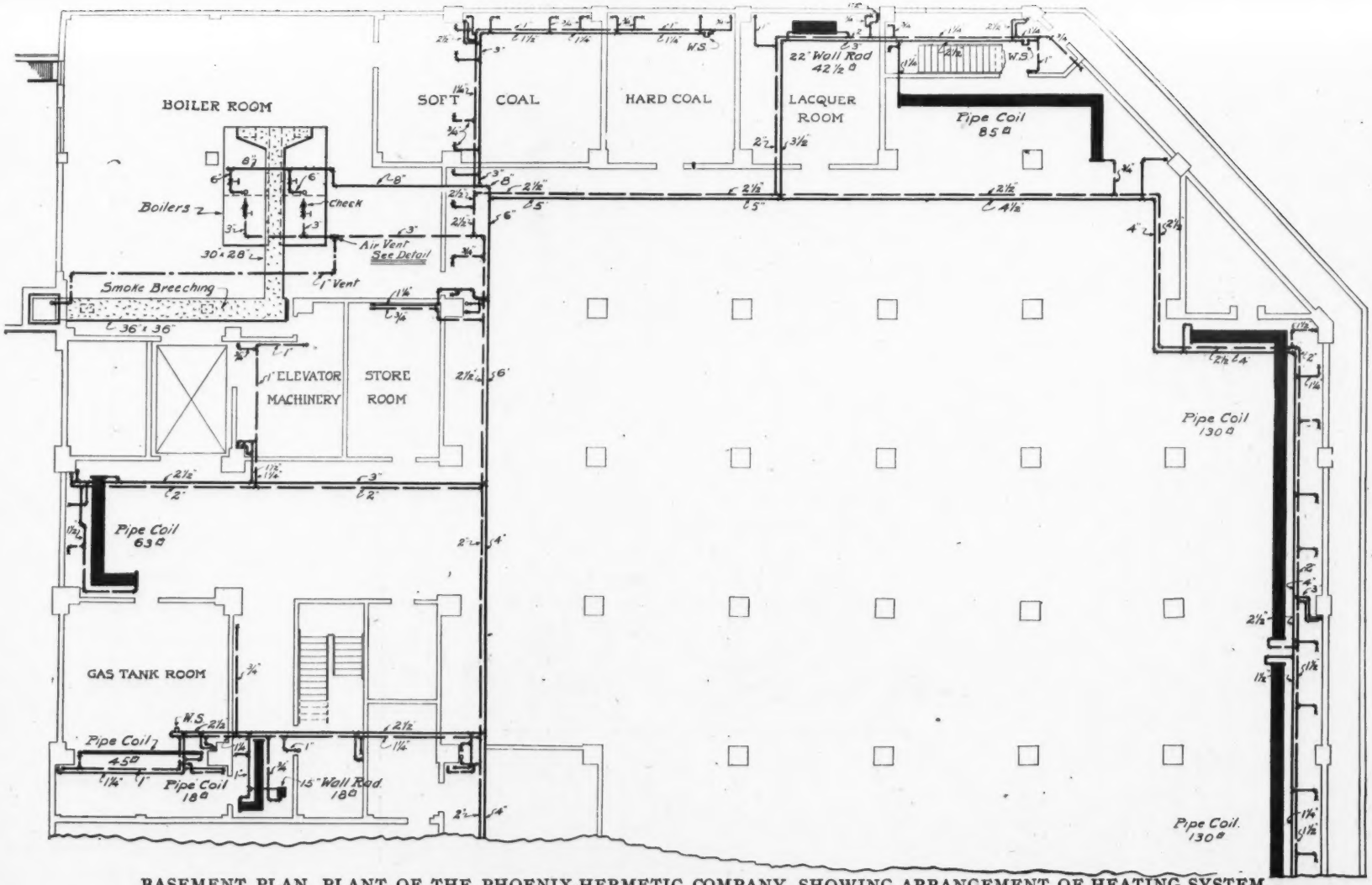
The electrical power for the building is supplied by a 100 h.p. vertical, four-cylinder, four-cycle Foos gas engine, direct-connected to a Sprague electric generator. This is located in the gene-

rator room. A small air compressor, belt-driven by a 4 h.p. Foos gasoline engine furnishes the compressed air for starting the large gas engine. This type of generating unit was selected because it had been used in the Chicago plant of this firm for a great many years and had been found to be highly efficient, particularly on account of the fact that a large quantity of gas is used by this concern in drying and baking ovens. Consequently the gas for use in the engine can be made at a cheap rate. In the gas tank room is located the gas producer for supplying the gas for the engine and for manufacturing purposes. This producer was manufactured and installed by the Flinn & Dreffein Co., Chicago. It is about 12 ft. high and 7 ft. 6 in. in diameter. After the gas is manufactured in the producer (in which pea coal is used for fuel) it passes by natural circulation into the equalizer, where the proper amount of air is automatically mixed with the gas. From there the gas passes into the scrubber, which is a large tank with layers of coke over which the gas passes to be cleaned. Water flowing over trays through which the gas must pass serves to clean it and also to cool it. It finally passes through a layer of excelsior in the top of the scrubber, which is the last cleaning process.

The 8-in. pipe supplying the gas for the engine is taken directly from the top of the scrubber, the flow being accelerated by the suction in the engine cylinders. A 4-in. line is also taken from the top of the scrubber to supply the high-temperature dry rooms, located on the top floor. This 4-in. line runs to a Sturtevant blower which blows the gas through the 4-in. line to the top floor by producing pressure on the gas line of 1.1 to 1.6 lbs. per square inch. A re-

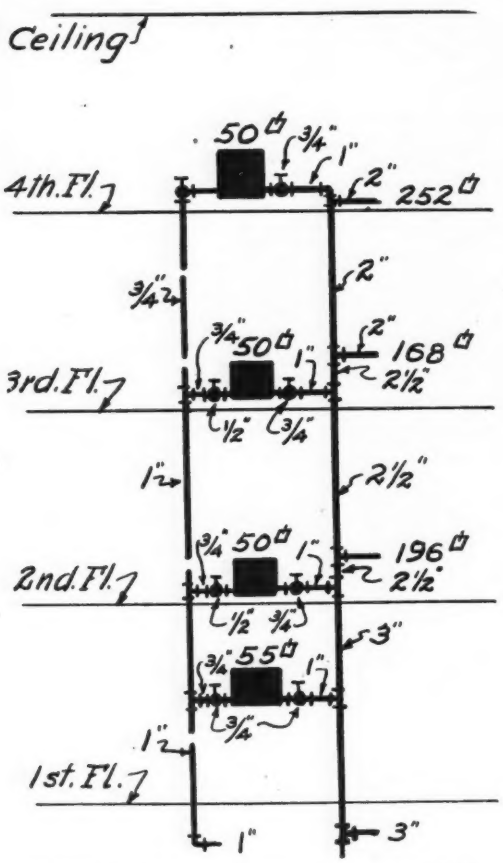


PLANT OF THE PHOENIX-HERMETIC COMPANY, BROOKLYN, N. Y.



BASEMENT PLAN, PLANT OF THE PHOENIX-HERMETIC COMPANY, SHOWING ARRANGEMENT OF HEATING SYSTEM.

circulating connection is made around the blower by means of a back-pressure valve, so that, when the demand is light in the ovens, causing a pressure to be built up in this line and lifting the back-pressure valve, some of the gas will be recirculated instead being all taken from the scrubber. A ¾-in. steam jet from the high-pressure boiler is connected to the pipe from the producer to the equalizer and accelerates the draft in the producer. There is also an 1¼-in. steam connection to the 6-in. line running to the roof from the equalizer which is used when starting up to increase the draft in the producer.



TYPICAL RISERS AND CONNECTIONS.

All the water for the building is supplied by a 6 × 8-in. motor-driven Deane pump, being taken directly from a well sunk in the boiler room to a depth of 160 ft. The water is pumped to a house tank located in the tank room on the roof of the building and is distributed through the building from that point.

SELECTION OF HEATING SYSTEM.

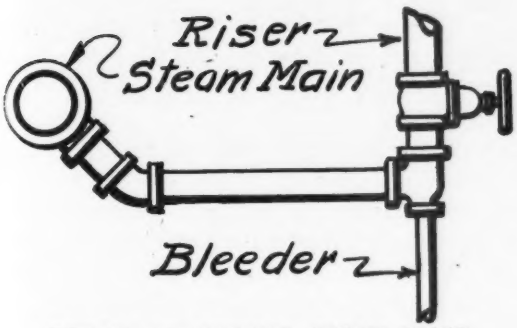
The heating system is a Positive air return system and was installed by the H. P. Stephenson Co., contractors. By venting all the air from the system in the basement, all air valves were eliminated from the radiators and coils. An automatic valve was placed at the return end of each radiator and coil, instead of the ordinary hand valve, so that it is only necessary to operate the supply valve when shutting off a radiator or coil.

Two Oil City down-draft boilers, 90 h.p. each, supply the steam for the heating system. Boilers of this type were selected from a commercial standpoint. By burning soft coal considerable saving is effected in the operation cost of the plant. In order to comply with the smoke ordinance, boilers of the down-draft type had to be used. A 30 in. × 30 in. breeching of No. 10 black iron from each boiler is connected to a 36 in. × 36 in. flue, with provision made for a future boiler should the plant be extended. The brick stack is 36 in. × 36 in. and is about 80 ft. high.

THE PIPE RUNS.

A 6-in. steam outlet from each boiler runs into an 8 in. supply header near the ceiling of the boiler room and thence out into the basement storage space. It then divides into two mains, one 6 in. and one 5 in., running in opposite directions around the building, decreasing as risers and first floor radiator connections are taken off. These mains have a slight grade in the direction of flow. The riser connections are taken from the bottom of the steam main and the base of each supply riser is dripped through an impulse valve into the dry return main.

The first floor radiator connections are taken from the top of the steam main and grade back to the main. The end

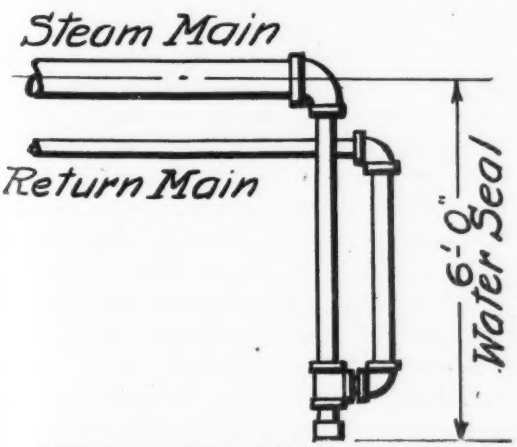


DETAIL OF TYPICAL STEAM RISER CONNECTION.

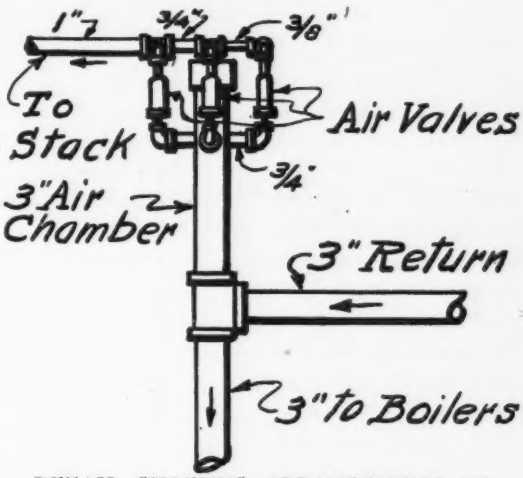
of each main is dripped through a loop seal of 1-in. pipe six feet deep, connecting back to the dry return main. Starting with 1¼ in. at these points two dry return mains are run underneath the steam mains, graded in direction of flow, increasing in size as radiation is added to them. Just before entering the boiler room the two-2½-in. mains are run into a 3-in. dry return main, and then back to the boilers.

Alongside the boilers, where the lowest point of the dry return is about 24 in. above the water line, a 3-in. all around tee is placed, looking up. This tee has a 3-in. capped nipple 12 in. long, with four-¾-in. tappings on the sides near the top. A thermo-float air valve is connected to each one of these outlets by means of a ¾-in. nipple and elbow. These serve to vent all the air from the system as no air valves are placed on the radiators or coils. From the outlets of these four valves, a 1-in. air line is run to the stack, connecting into the base of same. At the point on the return where these valves are placed the return drops to the floor and divides into a 3-in. connection to each boiler. Close to each boiler on the return is placed a check valve, a gate valve and a 2 in. blow-off cock.

The smoke flue in boiler room is covered with 1½-in. asbestos air cell blocks, put on over a 1-in. air space formed of wire mesh and studs, the whole being finished smooth with asbestos cement. The steam mains are covered with 85% magnesia covering 1 in thick, canvassed and banded, and the fittings covered with asbestos cement. All return mains are uncovered, serving as additional heating surface for the basement.



DETAIL OF SEAL AT END OF STEAM MAINS.



DETAIL SHOWING ARRANGEMENT OF AIR VENT.

HEATING OF FACTORY ROOMS.

The heating of the factory rooms in general is accomplished by means of wrought-iron pipe coils of the header type, with spring pieces. They are fastened to the walls with cast-iron hook plates and wrought-iron cleats. These cleats are of ⅜-in. by 2½-in. strap iron, and are held to the wall by expansion bolts. Overhead coils are supported by roller hangers, fastened to the ceiling.

Cast-iron radiators are used in the offices, halls and part of the first floor loft, where coils are not adaptable. The supply end of each radiator and coil is equipped with a Jenkins Bros. globe valve and the return end has an impulse valve as stated, of proper size. These serve to establish and maintain a standard difference in pressure between the steam and return mains, passing the air, water and a small percentage of steam into the return pipe.

DOMESTIC HOT WATER SUPPLY.

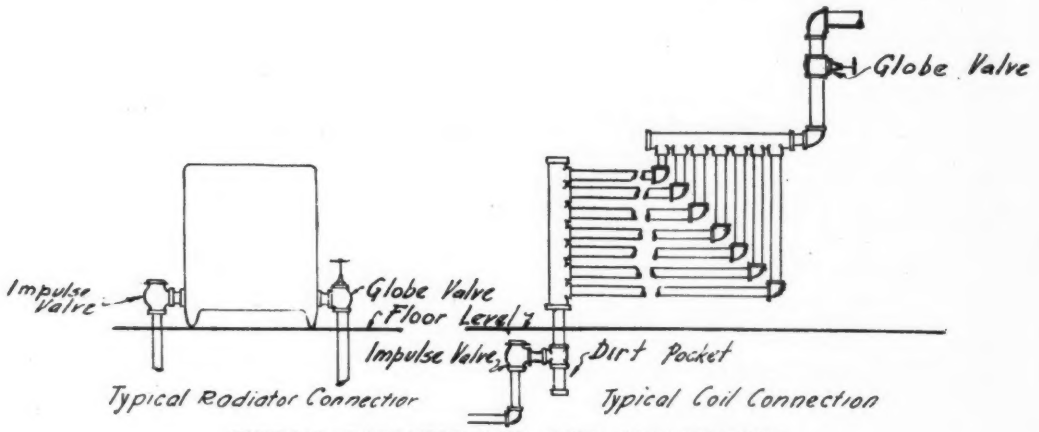
A No. 7 Patterson hot water tank, at the boiler room ceiling, is used during the heating season for heating the hot water for domestic purposes. A 2½-in. steam line is run from the main header of the boilers to the coil in the tank and a 1½-in. return connection is run to the wet return on the boiler room floor from same. Powers thermostatic valves are placed on both the supply and return from the tank. A thermostat is tapped into the shell of the tank and the tube from same is run to the thermostatic inlet valve. A 2-in. cold water supply line is run to the tank and a 3-in. outlet supplies the hot water for the building. The entire tank is covered with 1½-in. asbestos air cell blocks wired on and finished with a hard, smooth coat of asbestos cement. A No. 182 Ideal Premier hot water tank heater is connected with the Patterson hot water tank and is used in summer for heating the water. However, the tank is valved so that either method may be used to heat the water at any time.

A 5 h.p. Beggs vertical high-pressure boiler in the boiler room is used for supplying steam to the gas producer. A pressure of 40 lbs. is carried on this boiler, but the heating boilers are usually operated at a pressure less than 2 lbs. per square inch.

ELECTRIC CURRENT PRODUCED AT 3 1-5 CENTS PER K. W.-HR.

The total daily electrical load comprising the motor and light load is 360 K. W. hours. This current is produced at a cost of 3 1-5 cents per K. W. hour, due to the low cost of generating gas. The total amount of gas generated daily is 63,000 cu. ft., of which amount 11,000 cu. ft. is used in the engine and 52,000 cu. ft. is used for manufacturing purposes. The cost per 1,000 cu. ft. of generating this gas is 38 cents, which is a very cheap rate, although the gas is not as rich as that supplied by the public service company.

The heating season is from October 15 to April 15. During the season of 1915-16, 489 tons of 2,240 lbs. each of coal were used for heating, but during the past season 1916-17, only 441 tons were used. The coal used was mine-run



TYPICAL RADIATOR AND COIL CONNECTIONS.

bituminous coal, which can always be bought comparatively cheap. The discrepancy in the amount of coal used for two seasons was due to the fact that until last season the down-draft boilers were not fired and taken care of properly. Having a total of 7,005 sq. ft. of heating surface, there was 170 lbs. of coal used, per square foot of radiation for the last heating season. The total volume of the building is 1,200,000 cu. ft. Therefore, 0.62 lbs. of coal were used per cubic foot of contents, which is a very reasonable figure.

Dehydrating Fruits and Vegetables

By FRED R. STILL

(Read at the summer meeting of The American Society of Heating and Ventilating Engineers, in Chicago, July 18-20, 1917.)

It has been variously estimated that from 10% to 20% of the vegetables and fruits raised in this country are wasted because they are unfit for consumption by the time they are marketed and considerably more is greatly depreciated in value owing to deterioration. With all the amateur farmers engaged in raising crops this year, the proportionate loss will be more, unless decay can be avoided by dehydrating the product, but how to dehydrate it is the point we are interested in. It will not be attempted herein to tell you how is the *best way* to go about it, as *that* way has never been discovered. An attempt will only be made to indicate what may be done, how it can be done and how some have already done it.

Everybody knows from study or by experience that the simplest drying problem is usually quite complex, but where it involves dealing with substances which contain from 72% to 95% water which must be extracted without injury to the food value, flavor, odor, color or chemical composition, and this at the same time without a large investment or adding so much to the cost as to make the product unsalable at usual market prices, then it will be agreed that it is superlatively complex as an engineering problem.

DIFFERENCE BETWEEN DEHYDRATING AND DRYING.

It is the accomplishment of these essential elements, so necessary in preserving foods, that distinguishes "dehydration" from ordinary "drying," as the latter is commonly understood. "Dehydration" is accomplished by the evaporation of moisture at comparatively low temperatures, whereas "drying" is usually accomplished by applying as much heat to the material as it will stand so as to vaporize the contained moisture, only employing enough air circulation to carry away the moisture.

A certain concern in this country has done a lot of dehydrating of fruits and vegetables with very favorable results. But so far as can be observed, it is accomplishing nothing but what others have done in specific cases. Credit is due this particular concern though for the laborious effort and expense put into the study of the effect of dehydration on a great variety of substances. This has provided their engineering staff with some very valuable data, whereby they know what are the critical temperatures of many substances and under what conditions the best results are attained most economically.

This method is not patented except as applied to one substance and probably is not otherwise patentable. We discovered an application title that they filed some years ago, which indicates they tried to patent it, but could never get it through the patent office to final issue. They have numerous patents on the dryer and devices in connection therewith, however.

The concern claims to be able to dry 25 tons of sliced apples per day of 24 hours with one of their standard outfits, allowing but 2 hours to dry. This is equivalent to about 2,083 lbs. per hour or 55 bushels of raw apples per hour containing 84.6% of water. When the apples are commercially dry there is still retained from 6% to 12% moisture. In fact, there is not much use trying to remove all the moisture from anything, as most substances will take up 6% to 8% moisture again from the atmosphere before packing in sealed receptacles can be accomplished.

This 84.6% of 2,083 lbs. is 1,763 lbs. of water, hence the absolutely dry fruit weighs only 320 lbs. or 15% of the raw weight, and commercially dry with 12% moisture retained weighs 364 lbs., there being 44 lbs. still retained in the output of the dryer per hour; 1,763 lbs., less 44 lbs. leaves about 1,720 lbs. of water to evaporate per hour.

In two of their patents they claim to have found the best results when raising the temperature about 61° F. above the outside atmosphere, and give as an example 70° outside, plus 61° or 131° inside. We will use these figures in this problem to illustrate some of the physical properties of air, heat, vaporization, cooling and refrigeration, not because we agree with their statements entirely, nor that they are even safe to follow in every case, but because they answer our purpose as well as any others. We would also add that all computations were made on a slide rule, so most of the figures beyond three digits are dropped, but the results are then even closer than should be figured without adding liberal factors of safety for such problems, involving, as they always do, so many indeterminate variables.

FIGURING A TYPICAL DRYING PROBLEM.

Assuming the outside air to be 70° F. and 50% saturated, the dew point is 50°, the wet bulb 58°, and each cubic foot of air contains 4 grains of moisture. Heating this air to 131° F. will raise the wet bulb to 77°. If this air takes up 3 grains of moisture while going through the dryer, it will then carry 7 grains, the dry bulb temperature will be reduced to 104° and the dew point will be 66° F.

Heating 1,720 lbs. of water from 70° to 104° and evaporating it at that temperature, heating 44 lbs. of water and 320 lbs. of substance having a specific heat of 0.50 from 70° to 131° F. and about 1,000 lbs. of conveying apparatus through these latter temperatures, also allowing about 30% to cover the leaks and the radiation from the ducts and dryer building, we find the total heat will amount to about 2,420,000 B.T.U. per hour.

If each pound of air drops from 131° to 104° while passing through the dryer, then it must give up 6.41 B.T.U.; hence dividing the total heat required by the dryer, by the loss per pound of air, gives us 377,500 lbs. of air per hour, or about 6,300 lbs. per minute, which is about 84,000 cu. ft. per minute at 70° F. This air must be raised from 70° to 131°, so the heat put into the air by the heating apparatus will amount to 61° $\times$ 0.2375 $\times$ 377,500 lbs., or 5,600,000 B.T.U. per hour. Hence the dryer efficiency will thus be about 43.25% on a heat basis.

EVAPORATIVE EFFICIENCY USUALLY ABOUT 50%.

This question of evaporation efficiency brings up a very fine point that often leads to endless discussion. Naturally if the air absorbs more moisture while passing through the dryer, the resultant efficiency will be higher. But in so do-

ing the outgoing temperature of the circulating air becomes lower. In other words, if, in the preceding case, the air had been completely saturated as it left the dryer, then the dry bulb and the wet bulb temperatures would be alike, or at 77°, instead of the dry bulb temperature being 104°. The effect of this would be to very materially slow up the drying process, start fermentation, cause the forming of mildew, discoloration and leave a bitter taste and bad odor with the product.

Just how far to go in saturating air within a dryer is one of the things to be learned by experience with every product you have to deal with. Besides, latitude and altitude have an influence on any dryer and calculations must take them into consideration in extreme cases. A dryer built to certain proportions, which had done splendid work in Florida all the year around, might prove a "bigger frost" in Bismarck, N. D., in the winter time than even the frost in the atmosphere of that noted cold spot. As a general proposition you are "playing safe" on most drying problems if you keep the heating efficiency around 50%. It is only the experienced specialist who gets above that mark and usually then by expert handling after installation.

OPERATING COSTS.

To furnish steam for this dryer would require 168 boiler h.p. Allowing 4 lbs. of coal per h.p. hr., it would require about 672 lbs. per hour, which at $5.00 per ton, would cost about $1.68 per hour, or about 3c per bushel of raw apples for the fuel alone.

To drive the fan would require about 60 h.p., but the exhaust steam from an engine could be used in the heating apparatus, thus making practically no cost for power, beyond lubricating oils, attendance, etc.

Allowing for depreciation, interest, insurance, taxes and repairs for a year, and coal, attendance, oil waste and supplies for 5 months continuous operation of 24 hrs. per day, it will cost about $40.00 per h.p. to run such a plant, or about $6,800.00 per annum. If it turns out 55 bu. per hour every day, including Sundays, for 130 days, the output would amount to 171,600 bushels. Hence the cost of operation would be about 4 cents per bushel.

Even if it cost 5 cents per bushel to dehydrate the apples, it is a good investment. For instance, supposing 10% of the apples would have decayed if they had not been dried, the loss would be 17,160 bushels. If they were worth, say, 50 cents a bushel, the loss would be $8,580. The great advantage, however, is due to the fact that dehydrated food will keep for years. It is not necessary to rush the fruits and vegetables to the market as soon as they are harvested, which naturally "bears" the market price, at the time when the farmer has his only chance to sell. Instead, he can pack his product in comparatively small packages and take his time to dispose of it, when the market conditions are favorable.

Few farmers have enough money on hand, however, to invest as heavily as would be necessary for a plant of this size. The proper thing to do would be to club together on a co-operative basis, or better still, incorporate, install a manager and run it as a community business, just as the beet sugar mills are run, only distributing the stock among the farmers instead of the city capitalists. This would be a much better way to go about it than for each farmer to attempt to buy a small plant for his own use exclusively. He is usually a poor manager of machinery, as well as a poor business manager, hence it would be of greater all-around advantage and profit to him, and to the consumer too, to invest in a corporation and be relieved of the necessity of looking after it. Such a corporation could even build fireproof warehouses to store the product, handle the sales on a commission basis, etc., much the same as the cotton business is handled in certain parts of Texas.

DRYING BY REFRIGERATION EXPENSIVE.

Returning to our problem again to consider another feature which frequently is presented: The question is often asked—"Why not put in a refrigerating plant to condense the moisture out of the air?" Well, the best answer is contained in a few figures, as follows:

The air leaving the dryer is at 104°, containing 7 grains per cu. ft. as 3 grains must be eliminated from each cubic foot; then the dew point must be reduced to 50°. Therefore, the temperature must be lowered 54°.

1 lb. of air containing 31.6% moisture, when lowered from 104° to 40°, will require the absorption of 20.56 B.T.U. Therefore, to take up the heat from 6,300 lbs. of air per minute will amount to 648 tons of refrigeration per 24 hrs.

If the air was cooled to 66° (which is the dew point for 104° dry bulb) by spraying with cold water from a well or spring and then lowering the temperature from 66° to 50° by refrigeration, it will require nearly 200 tons refrigeration. Such a plant would be too expensive and complicated to consider seriously.

Another question which naturally arises, is what will happen when the outside temperature rises to 95° F. and 60% saturation, as sometimes happens in the summer time?

The wet bulb temperature then is 82°, dew point 78°; if raised to 131° the wet bulb is raised to 90°. If 3 grains of moisture are added in the dryer, the dry bulb temperature then drops to 104° again, the air being 60% saturated with a dew point of 86°.

The only practical result would be the consumption of less steam and an increase in the length of time the apples had to remain in the drying chamber, owing to the increased humidity of the air as it left the dryer. This latter could be compensated for by making the dryer large enough to allow, say three hours to dry, instead of two hours.

If a refrigerating plant was to be installed to take care of these latter conditions it would have a capacity of 1,000 tons instead of 648 tons.

CONDITIONS FOR RAPID DRYING.

All fruits and vegetables which can be pared, sliced or shredded will dry very rapidly. For example, 20 tons of potatoes, containing 78.3% moisture, can be dried per 24 hrs. in this same dryer, also 20 tons of sweet potatoes containing 69% moisture, or 12 tons of parsnips containing 83%, or 9 tons of tomatoes containing 94.3%, or 20 tons of carrots or turnips containing 88.2% and 89.6% moisture respectively.

When it comes to drying fruits unsliced, the capacity is very materially affected, as for instance blackberries, gooseberries, huckleberries, raspberries, strawberries, currants, etc., all contain from 82% to 90% of moisture, but only 3 to 4 tons can be dried per day of 24 hours in this same dryer, or from one-sixth to one-twelfth of the capacity when the product is sliced or shredded.

CAPACITY OF DRYER.

Several dryers have been designed by the writer, which have turned out an average of 30 tons of raw fruit daily, which contained 75% to 80% moisture, using an apparatus about two-thirds the size of what would be required in the foregoing example, but there is yet plenty of room for improvement. Such a dryer as outlined is about 50 ft. long, 6 ft. wide and about 12 ft. high, not including the drying apparatus. Usually trucks or cars with racks to support mesh-bottomed trays, carry the product, which is spread anywhere from ½ to 1 in. deep on the trays. Considerable ingenuity has been exhibited by some designers and patentees in efforts to get a perfectly even distribution of air circulation over the entire surface of each tray. Most of the patents granted simply cover this feature in combination with something else. Such methods always involve considerable handling and careful watching

to keep up the continuity of the cycles of operation, or else the output will be below the maximum capacity.

The fruit dryer having 30 tons capacity above referred to, is an automatic belt dryer. There is no handling of the product from the paring and slicing machine to the packing room, all being done by conveyors, bucket elevators and chutes. The area of the conveyor in the drying chamber is about the same as the total area the trays would be for a car system, but the dryer is about 10 ft. longer on account of some waste space necessary at each end to accommodate the mechanism which operates the belts.

The first cost of one or the other is not much different, while the cost of maintenance and the saving of labor is decidedly in favor of the conveyor system. The employees who handle the trays, however, have a penchant for destroying them, also battering the cars or trucks; whereas they never have any occasion to touch a conveyor dryer. This is due partly to the fact that employees are not around a conveyor plant, as they are not needed to operate it.

DEHYDRATING FOODS BY VACUUM.

Another method of dehydrating foods is by vacuum. This, however, is too limited in capacity for serious consideration, unless a plant of huge proportions is installed, when it then parallels the cost and expense hereinbefore noted for refrigeration. The cycles of operation are bound to be slow and the labor cost excessive, with no compensating results other than can be obtained by the air circulation methods.

Probably a small outfit could be made which might be sold to the householder who has a little garden in his back yard, or who desires to put up vegetables and fruits when they can be bought cheap in the summer. Those who have never tasted any dehydrated foods will be astonished at the results. When properly treated and prepared, it is impossible for the most critical observer to tell which is fresh and which was dehydrated.

The writer has interested himself in this subject more or less for some years, but never, before this year, has there been much to encourage any effort to devise something to meet the requirements. Even now, with the high prices prevailing and the insistent urging by the government that all food be carefully preserved, there does not seem to be much likelihood of anything being done on a scale of such proportions as will go very far toward relieving the situation.

It will take years to get the farmer interested so that he will take active steps in that direction. Likewise, it will take a long time to interest the capitalist in such a project, when there are so many tried and proven opportunities for safe and profitable investment in things he knows more about, which are closer to him and in lines of business where he can deal with business men instead of farmers, who are not always noted for doing things in a business-like manner.

Without intending to criticize in the slightest degree but rather to suggest what appears like a more practical way of dealing with the food situation, than is proposed by the national authorities, it seems as though it would be wise to turn attention to the establishment of dehydrating plants in all of the existing canning factories. Such concerns have the organization to get the product from the farmers and to market it afterwards, both of which are big and serious problems for any new concerns to undertake.

Most canning factories have the power, the room, the men and the inclination to undertake it. All of them combined are likely to be unable to successfully handle the crop this year by the old method, because they can not obtain tin enough to make the cans. With a dehydrating plant as an auxiliary they could turn out both kinds of product, and perhaps take care of the crop. Many of them lack money to do it, in which case the government

should loan it to them on long time and easy terms. If all the crops, which there is every prospect will be raised this year, could be dehydrated before marketing, excluding wheat and corn, there would probably be 150% more than is required, as undoubtedly 60% of the stuff raised goes to waste before it is consumed as food by the individual householder.

The freight saved in transportation by railroads and ships, the warehouse space saved, the cleanliness, the prevention of the boosting of prices by cold storage warehouses (as so many think is done), in fact, everything one can think of favors dehydration, and at present every known substitute fades into insignificance by comparison.

Hot Water Heating System of Crane Co. Chicago Works

By F. E. McCREARY, Engineer Crane Company.

(*Read at the summer meeting of The American Society of Heating and Ventilating Engineers, in Chicago, July 18-20, 1917.*)

After considerable time had been spent investigating the various heating systems applied to large manufacturing plants, hot water heat under forced circulation was adopted as the best system to install for the particular conditions at the new plant of the Crane Company. The plant comprises a plant of 160 acres, 151 of which are effective for building purposes. It is bounded by Kedzie Ave. on the east, extending back to the Santa Fe Railroad shops on the west, by 39th Street on the north and 43rd Street on the south. A total building frontage of 2,470 ft. is set back 150 ft. from Kedzie Ave.

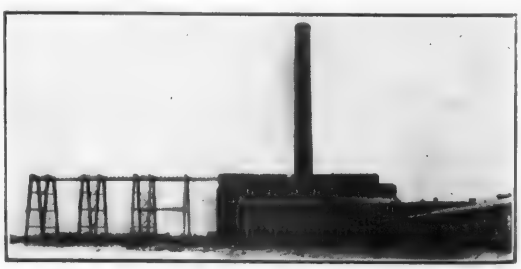
From north to south, the buildings are divided into six groups, lettered from A to F. Each group extends westward from Kedzie Ave., numbered consecutively. The A and F groups receive the raw material, and it is passed through the works systematically, and the finished product delivered for shipment from the central group.

The finished plans call for the erection of about fifty buildings, having a floor area of about fifty acres. Most of the buildings are of the two-story type, with no basements. The office building fronting the center group is five stories high. All the buildings are of modern reinforced concrete construction.

The completed manufacturing plant was estimated to cover the land east of the boiler house, and the total estimated amount of radiation to be about 450,000 sq. ft. of which at present exclusive of the office building, there is 300,000 sq. ft. in service; the balance is to be completed in the next few years.

The boiler plant, described hereinafter, is a steam service station for the works, supplying power for air compressors and heating equipment only, and steam for domestic hot water service, testing, etc.; exhaust from compressors and pumps is turned into the heating system and contributes its part to the general result.

The plant is divided into six 9-in. cir-



POWER HOUSE, CRANE COMPANY PLANT.

VIEW OF BOILER ROOM.

cuits, each controlled from the boiler house direct. As the office building would have to be operated at times when there was no need of heat on the works, and particularly to reduce the pumping head for the works circuits, a separate and duplicate equipment was installed for this building, which at present contains 13,240 sq. ft. of direct radiation, including the mains. The equipment in the boiler house was made large enough to handle three more stories, which would give a completed total of radiation of 21,640 sq. ft.

The office building supply mains are so arranged on the ceiling of the fifth floor that they drop to the floors below, and so the first one fed is the last one picked up on the return main, which is located on the ceiling of the first floor.

All radiators run in size from 70 sq. ft. to 130 sq. ft. and are fed at the top with the return at the bottom. The size of feed and return in all cases has been made one inch, each supply and return having a brass gate valve with union made thereon. All the fittings from 2 in. and down are standard screwed; from 2½ in. and up No. 1 long sweep ells and No. 2 long sweep double branch elbows and crosses, the sweeps turned in direction of flow. These fittings greatly minimize the friction in the system and tend to a more rapid circulation. They were all bushed in the sand, thereby cutting down the number of screwed joints.

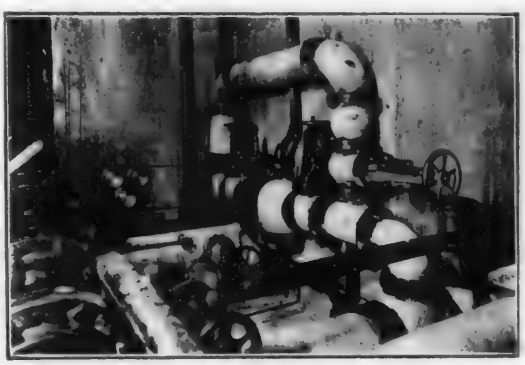
About the 22nd of August, a year ago, on a very cold, raw day, the office circuit was started and in 25 minutes the water was up to 110°; then the heat was turned off and the building was very comfortable the rest of the day.

Length of travel of water in office circuit is 2,630 ft., the static head on office 33 lbs., the pump discharge gauge, 48 lbs., or 15 lbs. maximum friction head (34.88 ft. or 1.33 ft. per hundred), which is well within the limits of 2 ft. per hundred on which the plant was figured.

We have divided the works heating system off into six circuits, each controlled direct from the boiler house. As previously mentioned, this arrangement gave a less static head to work against and allowed for greater flexibility of pumping water to the more exposed buildings. When starting up the works system it ordinarily takes 4½ hours to bring it up to temperature.

The boiler house and buildings are connected at present through the following lengths of tunnels:

770 ft. of 15-ft. wide tunnel
1310 ft. of 8-ft. wide tunnel.
1638 ft. of 6-ft. wide tunnel.

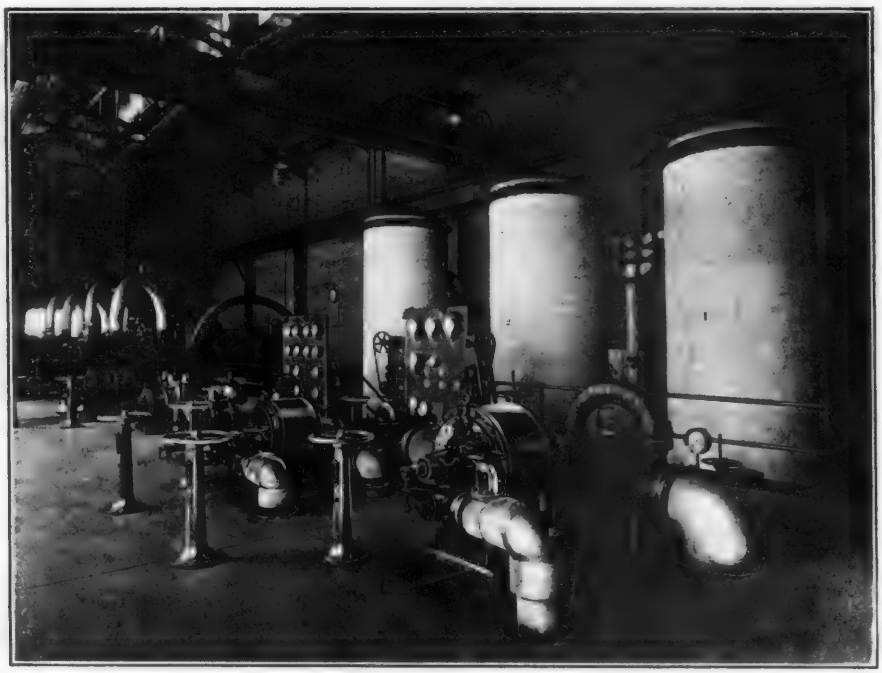


DIFFERENTIAL CONTROL VALVE FOR CONTROLLING HEATING SUPPLY TO BUILDINGS.

Present 3718 ft. of tunnels.
Proposed 1260 ft. of 6-ft. (future) tunnel.

Total 4978 ft. of completed tunnel system.

Seven expansion pockets are provided at present in the tunnel system for taking care of expansion of all the piping mains. All the mains are hung on 10-ft. centers from the flanges of beams throughout the tunnel system which are left bare to expedite the hanging. In the mains, one-half of the figured expansion was taken up cold; bends were used wherever possible.

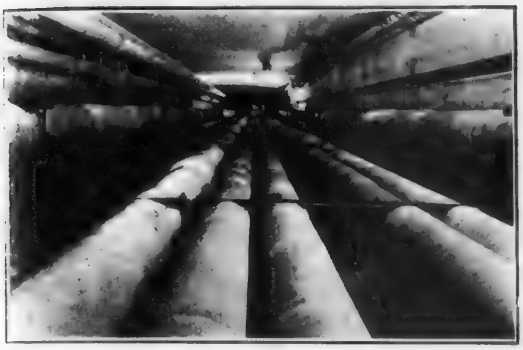


HEATING EQUIPMENT AND COMPRESSORS IN POWER HOUSE.

At each building there is left a 30-in. square opening for the lines which serve it; a 2 × 15-ft. opening in ceiling of expansion pockets and a 2 × 8-ft. opening are left on main runs of tunnels to facilitate the installation of the piping. Every endeavor has been made to standardize the construction as far as possible.

In the shop buildings, which are mostly two-story structures, the supply and return mains are hung from the ceilings of the second and first floors respectively, close up to the walls above the windows, so as to facilitate the hanging of countershafts, etc. Connections are made to the mains so that the first coil fed is the last coil picked up on the return, thereby balancing the flow of water to the coils, which prevents short circuiting and tends towards a uniform distribution of water. To further regulate the supply of water to the coils a lock and shield valve is installed on both supply and return near the mains. It has been found that the best practice is to leave the feed valve wide open and check on the return. One of the main reasons for installing lock and shield valves was to prevent everybody tampering with the system.

On the first section of the buildings, the size of feeds and returns was cut down to what was the general practice for gravity work. Our second floor coils, now the feed connections, have been made 1-in. As the first floor coils are being fed on a drop leg, the sizes were made larger than the second floor. The coils are made of 1½-in. pipe and are eleven pipes high, double and single. They are mitered up to the pilasters between the windows. All the coils are run level and are supported every 10 ft. by



THE MAIN PIPE TUNNEL, 15 FT. WIDE.

a specially designed cast-iron support, which is set in the concrete floor and held to window frames with two ⅜-in. lag screws (see Page 33).

The main reason why pipe coils were installed instead of cast-iron radiation is that the pipe coil will withstand the harder shop service. All supply and return connections to radiators are made with special center back-outlet return bends, union ells and tees of the railroad type, thereby cutting down the number of joints to a minimum. The setting of sleeves in floors has been reduced to a standard, thereby expediting the work of steam fitting.

AIR REMOVAL.

The greatest thorn in the side of all heating systems is the removal of air therefrom. The greatest trouble with all air removal devices is that the outlets are entirely too small and any dirt from the lines clog them up, thereby making floats stick, allowing the water to come through. Air always hunts the high points; and as all radiators on this job have a top feed and bottom return, the air works up through the coils and risers to the feed main on the second floor ceiling.

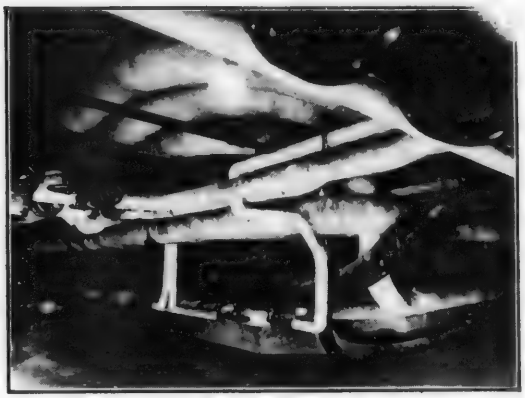
In the last buildings, the ends of the feed mains have been tied together with 1-in. lines with sediment traps (that come with traps) which connect to a ½-in. special direct-return air-venting trap, located above the feed mains. The supply side of this trap is connected to it with an air chamber, which in turn is hooked up to the aforementioned 1-in. lines. The top of the air chamber is connected to the trap body with a ⅜-in. armored air hose.

The water rises and fills the trap, and as the air comes into the system it rises to the air chamber and displaces the water in the trap until the water is all driven out when the counterweight of the trap drops and releases the air to the atmosphere, after which the water rushes in and completes the cycle. The beauty of this scheme is that it embraces a sediment trap which is blown out occasionally and it vents through larger size openings. One trap has been in operation now two seasons and they are now installed throughout the whole plant. The relief of air from the system has a great deal to do with the life of the equipment and the results obtained.

ARRANGEMENT OF TUNNEL LINES.

Leaving the heating equipment in the buildings and entering the tunnels going toward the power house, all the mains of the buildings are connected into them through a differential control valve for controlling the amount of water to supply the radiation in each building. A J. C. Hornung differential control valve is

A SECTION OF THE 6-FT. WIDE TUNNEL.

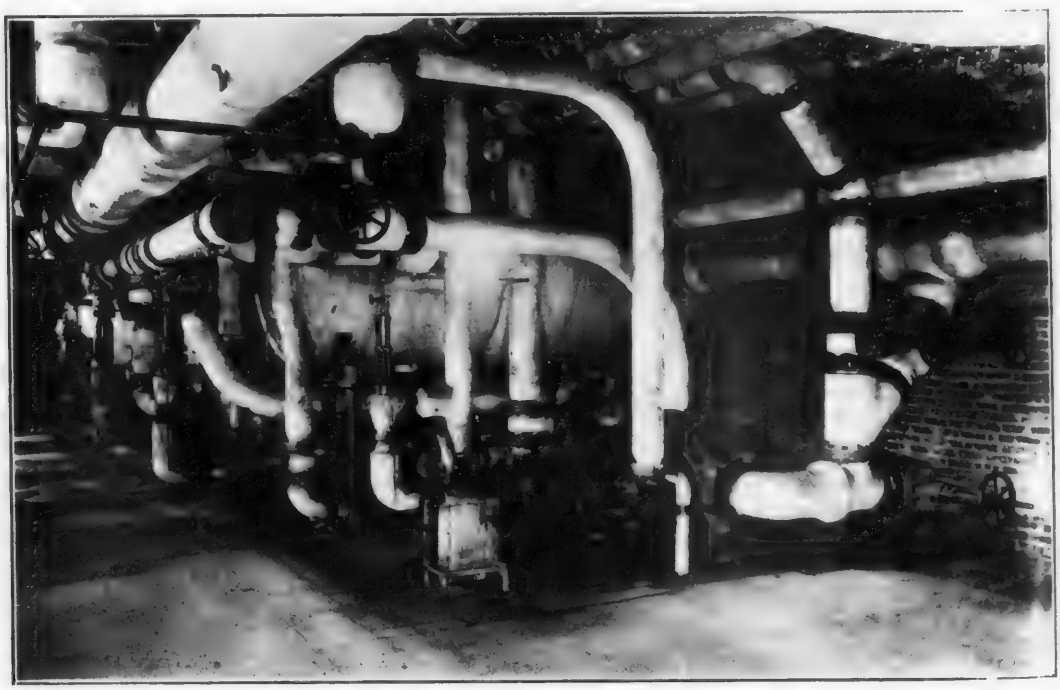


JUNCTION OF THE 15-FT. AND 8-FT. TUNNELS.

used to regulate the difference in pressure between the supply and return of the service pipes, as otherwise the buildings nearest the pumps would circulate under the greatest differential and, due to the friction in the mains, the differential would decrease toward the end.

One advantage with this valve is that it can be adjusted to meet any change in amount of radiation added to or taken from the buildings. The valve is of the balanced type, actuated by a diaphragm and is installed in the supply serving the radiators. Being of the self-contained pattern, no control pipe is needed, as the reduced pressure acts internally along the stem upon the diaphragm. The return main from the system of radiators under control is given a connection to the bottom side of the diaphragm, so that the reduced pressure in the supply main acts upon the top side of the diaphragm and the pressure in the return main acts upon the opposite side of the diaphragm. This would at once tend to place the valve in such a position that no water would pass through it, as equal pressure will prevail on either side of the diaphragm. If now the adjusting screw is turned to compress the spring on the lever side of the diaphragm, a new balance prevails whereby the pressure on top of the diaphragm which is the reduced supply pressure must equal the return pressure, plus the pressure exerted by the spring.

In the practical application of the differential valve, the spring pressure represents the friction head in the system of radiators under control. The valve is adjusted for proper friction head to



DOMESTIC HOT WATER HEATERS AND PUMPS IN BASEMENT OF POWER HOUSE.

maintain the desirable circulation and maintains the head or differential regardless of fluctuations in either supply or return.

Regarding the figuring of mains, a friction drop of 2 ft. in 100 ft. was taken as a base on which our plant was designed. The longest travel of the water from the pumps through the mains and back to the heating equipment is 4,500 ft. or 34 lbs. maximum friction head, or, reduced to feet, practically 79 ft.; this is 1.75 ft. per 100-ft. run, which comes well within the limits prescribed.

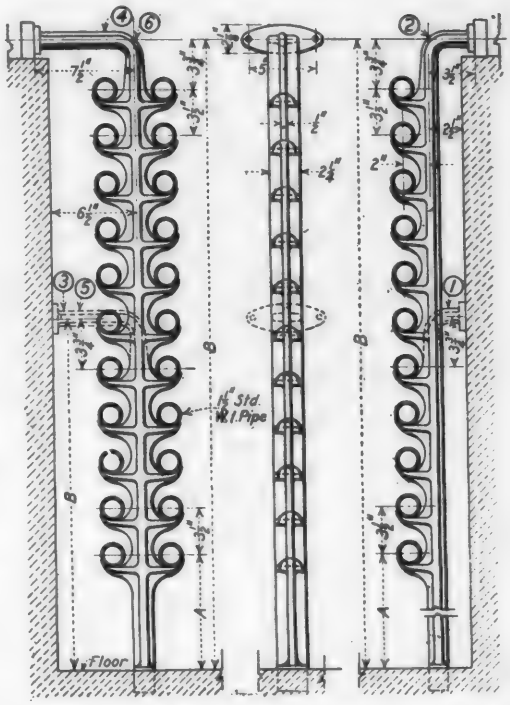
Two pumps were in service this past winter operating at the following rate:

Pump	Delivery gal. per min.	Speed r.p.m.	Percentage of Rating
No. 1	3000	1385	86
No. 2	2323	1600	66
Total	5323 gal. per min.		

Rated capacity

3500 gal. per min. at 1600 r.p.m.
3500 gal. per. min. at 2400 r.p.m.

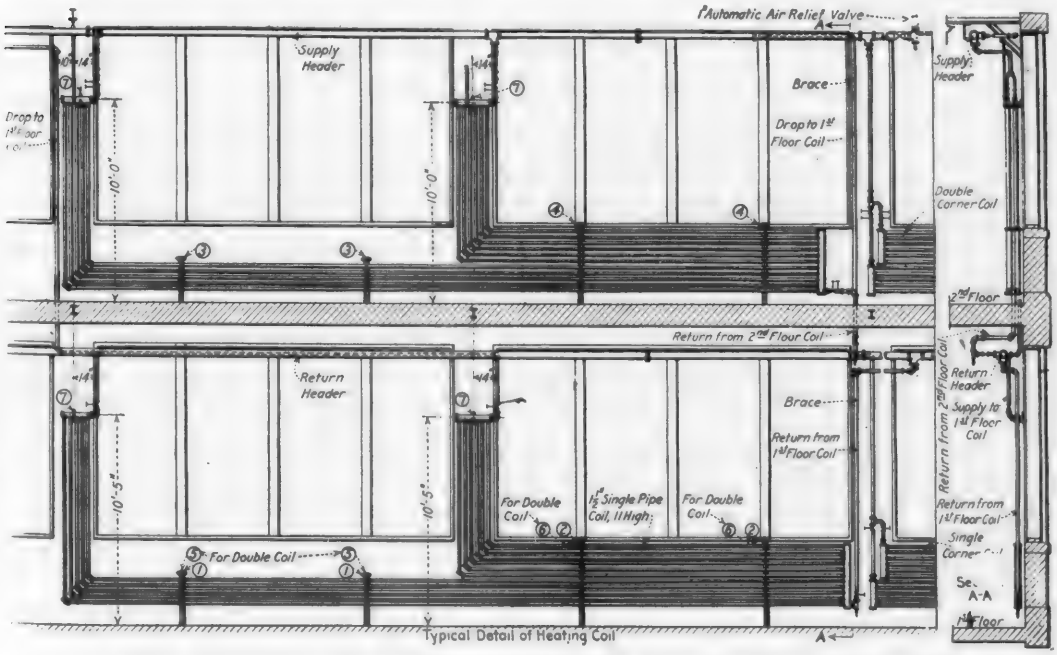
5,323 gal. per min, for 300,000 sq. ft. of radiation reduced to pounds per square foot per hour at an average temperature of 125°, or 8.21 lbs. per gallon, gives 8.75 lbs. of water per square foot per hour.



DETAIL OF PIPE COIL SUPPORTS IN BUILDINGS.

The layout was estimated on 9 lbs. of water per square foot per hour.

Two 5 × 12-ft. expansion tanks are connected together and a 3-in. line runs

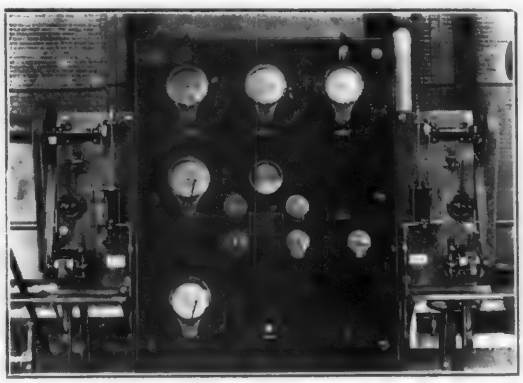


TYPICAL DESIGN OF HEATING SYSTEM FOR ONE SIDE OF A BUILDING, CRANE COMPANY PLANT.

down and is connected into each return line to the pumps. The overflow from each of these tanks was connected into the two 20,000-gal. storage reservoirs under the test room floor. The water supply to the expansion tanks is controlled by a float valve and the expansion tank overflow level is 33½ ft. above the boiler room floor line. The highest feed main is 30 ft. above the boiler room floor line. When the water returns to the boiler house it goes through three 12-in. volute pumps driven by three 125-h.p. direct connected Kerr steam turbines. The writer would like to advise the use of 1,600-r.p.m. pumps for this service, instead of 2,400-r.p.m., as there is likely to be less trouble with the slower speed equipment.

After the water has passed through the pumps and the three 3,600-sq. ft. two-pass type heaters of 484 2 in. by 14 ft.-long tubes, it is returned to the buildings at the required temperature under the control of a Powers system of temperature regulation. The flow line leading from each heater is provided with a thermostat operated by compressed air, and this thermostat controls automatically a diaphragm valve mounted on the steam supply to the heater. The thermostats are adjusted over a considerable range of temperature by means of adjustment switches located on the service board on compressor-room floor. This service board carries in addition to the adjustment switches for the several heaters, a set of Bristol temperature recording thermometers, for each of the heating circuits. These thermometers are of the double registration type, and their sensitive bulbs are located in both flow and return lines, so that the recording charts present a continuous record of the water temperature as it leaves the power house, also as it comes back. The operating engineer by observing the outdoor weather conditions, may set his adjustment switches to send the hot water out on the various circuits at the proper temperature and thus have before his eye or ready for observance, the apparatus and the amount of heat given out from the different circuits from the time the hot water leaves the station until it returns.

Compressed air for the operation of this system is supplied by electric motor-driven compressors, installed in duplicate, one on each side of the service board. These compressors are under automatic control, operating only when necessary to maintain the 15-lb. air pressure used in the operation of the control system. Along the south wall of the compressor room are indicator floor-



TEMPERATURE REGULATION SERVICE BOARD IN POWER HOUSE.

stands for the manipulation of the main valves in the various circuits.

CONDENSATION AND LIVE STEAM.

A float-chamber on the side of a heater controls the removal of the condensation for every two heaters, the pump discharging into two open feed-water heaters operated in parallel and belonging to the boiler plant. Should the feed-water heaters be out of service, the condensation may be discharged into the large service reservoir under the building.

A 10-in. connection is made to the 150-lb. saturated steam supply. This 10-in. line contains a Crane strainer and branches out into two 6-in. lines, leading into two 6-in. Crane pressure regulators which reduce from 150 lbs. pressure down to 2 lbs. back pressure, which the air compressors run under. In all cases where possible a strainer should be

installed which would afford protection for the regulator.

BOILER HOUSE.

The boiler house which serves the plant is located 920 ft. back from Keddie Ave. and 100 ft. south of the axis of the plant. The location of the various equipment was carefully studied with the main idea of accessibility and to occupy the least amount of space.

In the boiler room there are six 5,080 sq. ft. Babcock & Wilcox water tube boilers, built to withstand 200 lbs. working pressure, and running under 150 lbs. working pressure. Each boiler is served by a Bayonne chain grate stoker with 102 sq. ft. of grate surface, a ratio of 1 to 50. There is also one 2,540 sq. ft. Babcock & Wilcox water tube boiler built for 350 lbs. working pressure served by a Bayonne chain grate stoker, with 51 sq. ft. of grate surface, a ratio of 1 to 50. There is one separately-fired superheater of the three-pass type capable of raising 5,000 lbs. of steam an hour at 350-lb. pressure to a total temperature of 800°.

The boilers and superheater are served by a steel breeching lined with 1½ in. of vitrified asbestos board and ½ in. asbestos finish. Through an opening of 134 sq. ft., the gases are discharged into a Custodis radial-brick stack having an inside diameter of 12½ ft. and rising 225 ft. above the boiler room floor line.

Coal is taken from cars by a Shepard two-drum monorail crane equipped with a 1½-yd. bucket. From the cars to the bunkers the crane has a capacity of 50 tons of coal per hour. Individual bunkers serve each boiler and coal is chuted directly to stoker hoppers.

Steam is conveyed from each battery of boilers by two 6-in. leads to a steel manifold in the basement, and this manifold has an 8-in. connection to each air compressor, and also an 8-in. connection to the main 10-in. steam header for supplying the heating system. There is also a 5-in. line off of the center which serves the 5-in. auxiliary header supplying the pump room. Each manifold has a drip pocket which is served by a Cranetilt non-return trap that returns the condensation to the feed water heaters. The installation of these manifold headers takes all the steam from the boilers to the lowest point in the system, where it is relieved of a large part of the condensation, thereby reducing the liability of water going over into the air compressors. Steam to the air compressors is passed through extra-heavy receiver steam separators, of ample size to reduce pulsations.

WATER SUPPLY.

A 10-in. city water line extends the full length of the pump room to supply the various pumps and heaters. Two 3-in. lines serve two reservoirs each of 20,000-gal. capacity, located under the test room floor. These reservoirs serve the pumps through a 12-in. suction line, the end of which terminates in the 4,000,000-gal. pond out west of the boiler house. The boilers are served by two Blake-Knowles pot-valve plunger pumps, each rated to handle 4,000 boiler h.p. There is a specially designed cast-steel air chamber connected on the discharge of each pump and anchored to the ceiling; these chambers each weigh 2,200 lbs. These pumps take their water from two 2,500 h.p. Cochrane open-type feed water heaters.

AIR COMPRESSORS.

The air compressor plant consists of two 2,500-cu. ft. and two 4,375-cu. ft. cross compound Allis-Chalmers air compressors, delivering air at 90 lb. pressure to the works, a total combined installed capacity of 13,750 cu. ft. The high-pressure air cylinders from each engine discharge into a receiver and through leads from each of these receivers to a 12 in. air main, which terminates in 8 in. north and south mains in the east lateral tunnels.

The large foundry buildings on the north and south of the works have 5-in.

mains running the entire length of the buildings. These 5-in. mains each have three 42-in. × 10-ft. diameter receivers connected to them. There are at present installed in the various buildings nineteen of these receivers, which are all tested to 165 lbs. hydrostatic pressure. On all the air piping standard malleable screwed fittings, standard gate valves and Crane nine cocks were used.

HOT WATER.

The hot water for domestic service is supplied by two Baragwanath type heaters of 5,000 gals. per hour, each 5½ ft. diameter by 10 ft. long, having 490 sq. ft. of 1½-in. No. 15 gauge brass tubes 46 in. long. The exhaust steam is supplied through a Powers regulator diaphragm valve and the make up steam through a Crane pressure regulator. Three Worthington Kerr-turbine-driven pumps serve the above heaters and deliver the water to the 6-in. circulating mains throughout the tunnels.

All the piping on domestic hot water, air lines, service and heating mains in the tunnels are standard steel pipe with standard ferro-steel Cranelap flanged pipe and ferro-steel flanged fittings from 6 in. and up; from 2½ in. to 6 in., the piping is standard cast-iron flanged and from 2 in. and down it is standard cast-iron screwed. There is also an 8-in. service main which serves the boiler house, filling the heating system and fire service throughout the works. The aforementioned pumps can be used either on service, domestic water lines, air compressor jackets, or ice machine coils.

DRINKING WATER SUPPLY.

A 30-ton Carbondale absorption refrigerating system cools the water for 140 drinking fountains now installed. About 225 fountains will be in service when the works are completed. The generator is built for 50 tons capacity and additional condenser coils will be installed in the near future. The ice machine and air compressor jackets are supplied through an 8-in. suction line from a pond of 4,000,000 gals. to the west of the boiler house by an 800-gal. Lea-Courtenay turbine driven centrifugal pump.

Air Cooling Schemes for Houses.

Speaking on the subject of "Prizes for the Inventor" before the graduating class of the McKinley Manual Training School in Washington, Dr. Alexander Graham Bell told the graduates about the experiments he had been conducting for cooling the air in his own home and emphasized the possibilities in this direction. This part of his address as published in the *National Geographic Magazine,* is given herewith:

The problem of cooling houses is one that I would recommend to your notice, not only on account of your own comfort, but on account of the public health as well.

I have found one radical defect in the construction of our houses that absolutely precludes the possibility of cooling them to any great degree. You will readily understand the difficulty when you remember that cold air is specifically heavier than warm air. You can take a bucket of cold air, for example, and carry it about in the summer-time and not spill a drop; but if you make a hole in the botom of your bucket, then, of course, the cold air will all run out.

Now, if you look at the typical tropical houses, you will find that they are all open on the ground floor. Supposing it were possible to turn on a veritable Niagara of cold air into a tropical house, it wouldn't stay there five minutes. It would all come pouring out through the open places below and through the windows and doors. If you want to find your leakage places, just fill your house with water and see where the water squirts out!

I began to think that it might be possible to apply the bucket principle to at least one room in my Washington home, and thus secure a place of retreat in the summer-time. It seemed to be advisable to close up all openings near the bottom of the room to prevent the escape of cold air and open the windows at the top to let out the heated air of the room.

DR. BELL'S OWN EXPERIMENTS.

Now, it so happens that I have in the basement of my house a swimming tank,

and it occurred to me that since this tank holds water, it should certainly hold cold air; so I turned the water out to study the situation. The tank seemed to be damp and the sides felt wet and slimy.

I reflected, however, that the condensation of moisture resulted from the fact that the sides of the tank were cooler than the air admitted. Water vapor will not condense on anything that is warmer than itself, and it occurred to me that if I introduced air that was very much colder than I wanted to use, then it would be warming up in the tank and becoming dryer all the time. It would not deposit moisture on the sides and would actually absorb the moisture there.

I therefore provided a refrigerator in which were placed large blocks of ice covered with salt. This was placed in another room at a higher elevation than the tank, and a pipe covered with asbestos paper was employed to lead the cold air into the tank.

The first effect was the drying of the walls, and then I felt the level of the cold air gradually rising. At last it came over my head. The tank was full, and I found myself immersed in cool air. I felt so cool and comfortable that it seemed difficult to believe that Washington stood sizzling outside. I climbed up the ladder in the swimming tank until my head was above the surface, and then found myself breathing a hot, damp, muggy atmosphere. I therefore speedily retreated into the tank, where I was perfectly cool and comfortable.

Guided by this experience, I tried another experiment in my house. I put the refrigerator in the attic and led the cold air downward through a pipe covered with asbestos into one of the rooms of the house. The doors were kept shut and the windows were opened at the top. The temperature in that room was perfectly comfortable, about 65° F.

At that time the papers were speaking of some ice plant that had been installed in the White House and congratulated the President upon a temperature of only 80° F. when the thermometer showed 100° outside. At this very time I enjoyed in my house a temperature of 65°, with a delicious feeling of freshnes in the air. Even when the air had risen to the same temperature as the rest of the house, as measured by a thermometer, the room still felt cool, because the air was drier, thus promoting perspiration that cooled the skin.

SELLING COLD AIR IN PARIS.

In this connection I may say that there is a very interesting cooling plant in Paris, France, run by the Societé de L'Air Comprimé. Very many of the cafés and restaurants in Paris have cold rooms for the storage of perishable provisions, and these rooms are cooled by compressed air supplied by this company.

The plant consists of large pipes laid down under the streets of Paris, with small branch pipes leading into the cafés and restaurants. At a central station steam-engines pump air into the pipes and keep up a continuous pressure of from four to five atmospheres. As there are several hundred kilometers of these pipes under the streets of Paris, they form a huge reservoir of compressed air at the ground temperature.

In the cooling room of a café they simply turn a little cock and admit the compressed air into the room. A gas meter measures the amount of air admitted and charges are made accordingly.

The compressed air, by its expansion, produces great cold, and the cooling effect is still further increased by allowing the air to do work during the process of expansion. Dumb-waiters, elevators, and even sewing-machines are thus run very economically in connection with the system by means of compressed-air engines.

WILL OUR CITIES BE ARTIFICIALLY COOLED?

Now, it appears to me that this process might very easily be developed into a plan for the cooling of a whole city. You would simply have to turn a cock in your room to admit the fresh air.

A Heating System of Korea.

A novel heating system called *ondol* has been devised by the Japanese living in Korea so that they may withstand the rigorous winter climate of that peninsula. In this arrangement the whole floor serves as a stove. The floor is first made with a layer of mud which is intersected by three or four flues which radiate from the fireplace and converge into the chimney on the other side of the room. Large slabs of stone are laid over the mud floor, the joints being made air-tight with clay. A layer of clay is then added on top of the stone and finally the whole is covered with thick oiled paper.

The fireplace is outside of the wall and the smoke and heat pass through the flues in the floor to the opposite side of the house. In this way the whole room is effectively warmed. It is said that no stove is needed in such a room even on exceedingly cold days.—*From Bulletin 39 of the Japan Society.*

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IN the bustle and hurry of putting the country on a war basis it is apparent now that many of the early warnings as to shortages in some lines of manufactured articles happily have been found unnecessary. For instance in a bulletin on "Substitute for Tin Cans," published some time ago by the Department of Commerce it was stated that in addition to the scarcity of tin, "the price of glass has steadily risen and has reached a point at which any large extension of its use for food containers is impracticable. At present fibre or paper containers of good quality are being produced in considerable and increasing quantities and, for many purposes, are supplanting glass and tin plate."

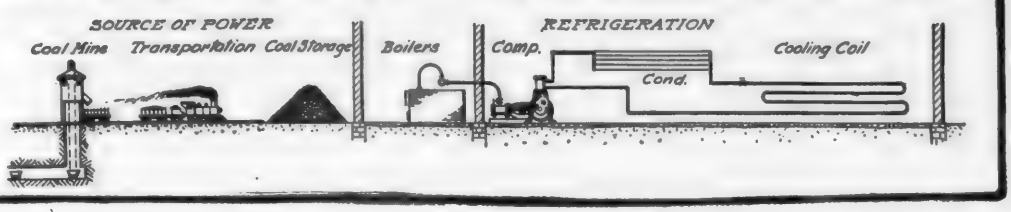
It was largely on the basis of this reported condition that the campaign was instituted for the mechanical drying of fruits and vegetables. While there has been some shortage of tin and glass containers the fact remains that an enormous reserve stock of eatables, surpassing anything heretofore known in this country, has been laid away in cans and jars against the extraordinary needs of the coming winter. Much good, however, has come from the agitation, for it has awakened the American public and particularly, heating and ventilating engineers, to the very great opportunities for creating a market in this country for dried foodstuffs. Government and other experts have given out valuable information as to the design and operation of the necessary equipment, much of the information, as is well-known, having previously been unavailable to the trade. With this advantage heating engineers will have none but themselves to blame if they do not step in and obtain their full share in the development of the food-drying industry.

For long after the war it is predicted that Europe will be dependent on the United States for much of its food supply and there, at least, the demand for dried fruit will be long and continuous.

NEXT month THE HEATING AND VENTILATING MAGAZINE will publish its second annual smokeless boiler number. Since the previous issue devoted to this subject, which appeared last October, the demand for fuel conservation has taken on new significance. Coal prices have soared to unheard-of heights and even with the intervention of the government, it is evident that we have entered a new epoch in the consumption of fuel. On top of this there is the present national call for the utmost economy in coal consumption, a call that appeals to the heating engineer as well as to the consumer.

The list of contributors to the smokeless boiler number will include men who have been most closely identified with the national campaign for the elimination of smoke, while other contributors will discuss the coal situation and the growing necessity for adapting boilers of all sorts to the smokeless burning of soft coal.

AIR COOLING AND REFRIGERATION



Application of Absorption System of Refrigeration

Having considered the theoretical end of absorption refrigeration, its practical application as embodied in commercial apparatus will now be discussed. For this purpose the apparatus manufactured by the Carbondale Machine Co., of Carbondale, Pa., may be taken as a good example of standard equipment.

In Fig. 1 is illustrated a complete absorption refrigeration plant with explanatory designations of the various parts and piping. The method of operation is to fill the generator with aqua ammonia sufficient to cover the steam coils, and the absorber with enough to cover the water tubes. Then the brine circulation through the brine cooler is started and the cooling water is turned on at the point marked "Water Inlet"; the water enters the lowest head of the condenser, travels through the condenser, then to the absorber, thence to the weak liquor cooler and lastly to the rectifier. By thus using the same water through four parts, in series, economy of water is obtained and the cost of operation kept low.

Steam is then turned into the generator coils and the evaporation of the ammonia therein builds up a pressure in the generator, condenser, and rectifier, rising until sufficient pressure is developed to condense the gas in the condenser. As the gas passes through the rectifier the cooling water reduces its temperature so that moisture, entrained in the gas, separates from it and returns to the generator through the drip pipe while the gas condensed in the condenser falls into the "Anhydrous Receiver." The liquid ammonia is then allowed to pass through the expansion valve into the brine cooler where it expands and absorbs heat from the brine.

The weak liquor left in the generator after the expulsion of the gas is drawn from the bottom of the generator through the heat exchanger into the weak liquor cooler and from there into the absorber where it meets the gas coming from the brine cooler and absorbs the gas. By this absorption the weak liquor becomes strengthened and is then strong liquor which is drawn into the suction of the ammonia pump and is discharged through the heat exchanger back into the generator.

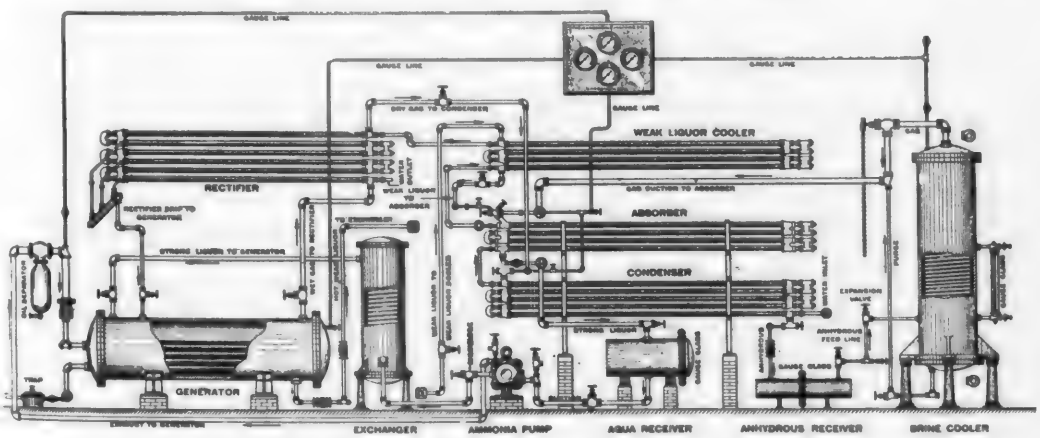


FIG. 1—COMPLETE ABSORPTION REFRIGERATION PLANT.

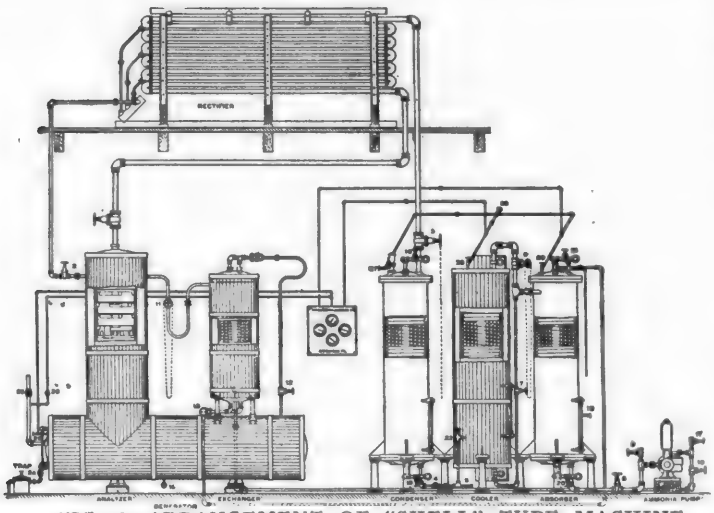


FIG. 2—ARRANGEMENT OF "SHELL" TYPE MACHINE.

SHELL-TYPE MACHINE, FOR USE WITH CLEAR WATER.

This refrigeration manufacturer provides plants of three types—the first and older type being illustrated in Fig. 2 and known as the "shell" type machine. It is particularly suited for conditions where condensing water is obtainable which is free from incrusting solids and dirt. Although of older design than some of the other equipment made, these plants operate with good efficiency and several have run for periods of over twenty years without renewals of apparatus.

ATMOSPHERIC TYPE, FOR USE WHEN COOLING WATER IS DIRTY OR WARM.

For cases where dirty or warm cooling water is encountered the second type of apparatus known as the "atmospheric" is used, this being illustrated in Fig. 3. With this equipment the rectifier is placed under the weak liquid cooler so that the water is first used on the cooler before descending to the rectifier. In like manner the condenser is placed above the absorber so that the condensing water is also used over the absorber.

DOUBLE-PIPE TYPE, LATEST DEVELOPMENT.

The third type of machine consists of a generator similar in design to the preceding types, and the rectifier, exchanger, weak-liquor

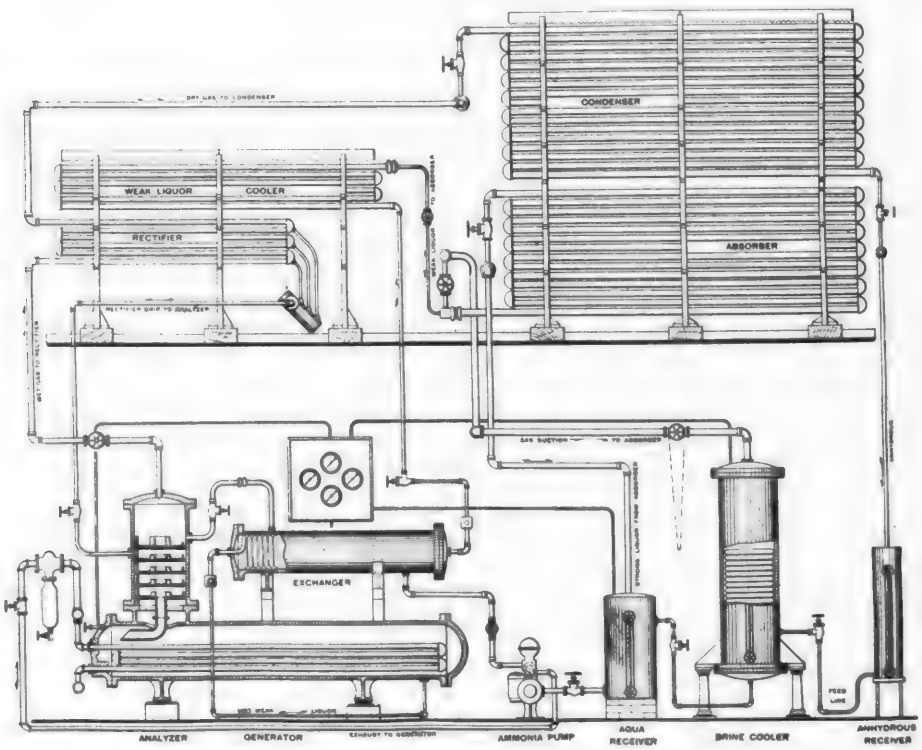


FIG. 3—ARRANGEMENT OF ATMOSPHERIC TYPE MACHINE.

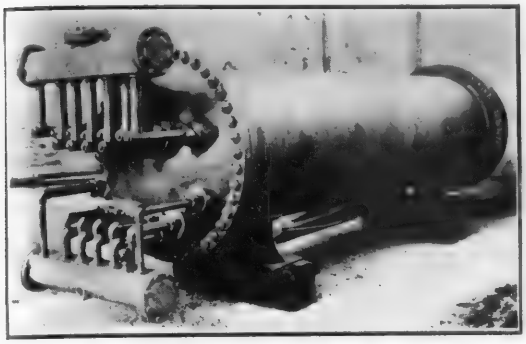


FIG. 4—STEAM GENERATOR FOR ABSORPTION REFRIGERATION SYSTEM.

cooler, condenser and absorber are all double-pipe construction. This is particularly adapted for low heat-room and is easily accessible. Containing nothing but straight pipes, it can be readily inspected and cleaned.

PARALLEL PROCESSES BETWEEN HEATING AND REFRIGERATION IN ABSORPTION SYSTEMS.

It is most interesting for the heating engineer to trace the parallel processes between heating and refrigeration; in fact, this analogy has been pointed out before for compression systems, but it can also be closely followed in absorption systems.

Take, for instance, the strong liquor after passing through the absorber; it is seized by the ammonia pump (boiler feed pump) and pumped back through the exchanger (feed water heater) into the generator (boiler) where the aqua ammonia is heated by the coils (fire) until it generates anhydrous ammonia gas (steam). The gas (steam) passes out through the rectifier (steam separator) and ultimately reaches the expansion valve and cooling coils where it expands and does work just as steam does in an engine.

USING EXHAUST STEAM IN REFRIGERATING PLANTS.

It would seem that a refrigeration system using exhaust steam as a motive power would be the answer to the problem as to what to do with the exhaust steam in the summer time in the building power plant. If a power plant can be made more economical when the exhaust is only used for heating in the winter, how much more advantageous would it be to employ the same exhaust in the summer to produce refrigeration in all its many desirab forms?

The generators which constitute the heart of the absorption refrigeration system are built of cast-iron in smaller sizes and of lap-welded steel in the larger ones. The steam is fed into the upper manifold shown in Fig. 4, and from the manifold enters the pipe coils located inside the

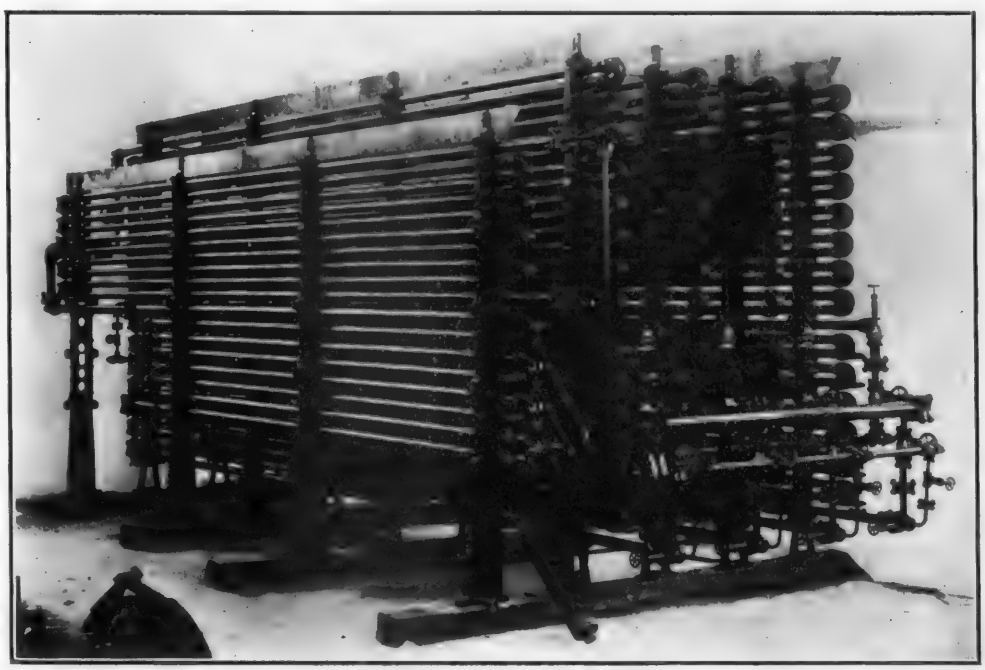


FIG. 5—ATMOSPHERIC CONDENSER, WITH ABSORBER BELOW AND WEAK LIQUOR COOLER AND RECTIFIER ALONGSIDE.

shell of the generator. As the steam condenses in passing through these coils the condensation flows out of the lower ends of the coils into the lower manifold, the action being in every way similar to a common hot water heater, heated with steam coils.

The condensers are either atmospheric, double-pipe, or shell type. As previously mentioned, the atmospheric type is best for muddy water or where scale is likely to be encountered. In the double-pipe condenser the flow of water is through the inside pipe and, as it is in a direction countercurrent to the ammonia, this type of condenser is very efficient. The shell type is

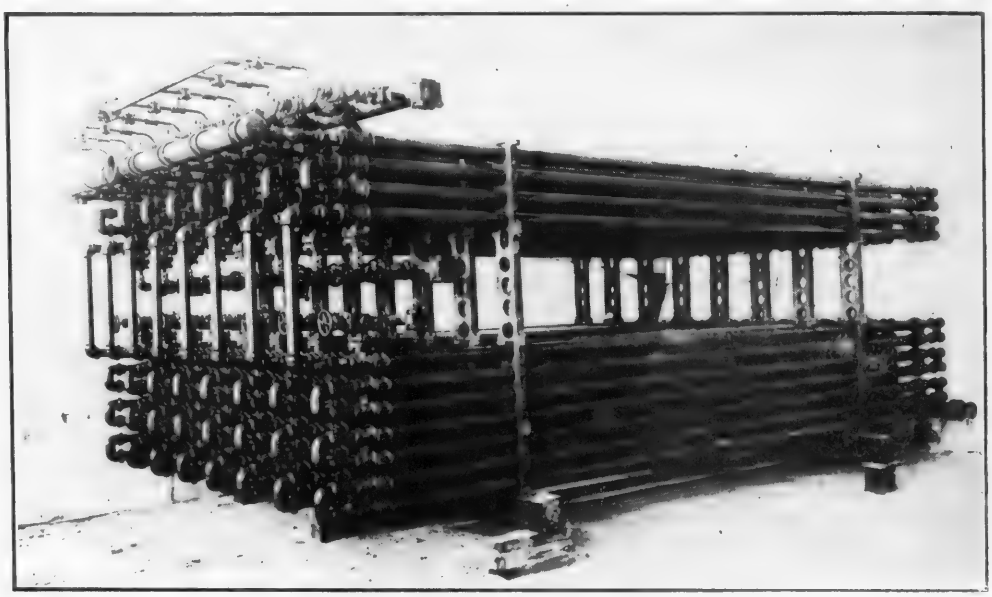


FIG. 6—DOUBLE-PIPE CONDENSER.

SHELL TYPE CONDENSER.

used where it is necessary to economize in floor space. A 50-ton condenser of this type requires only 5 ft. square floor space. Its chief advantage lies in the fact that it has a high water velocity in the coils, thus insuring a low condensing pressure and, besides, this has fewer joints than a double pipe condenser.

An apparatus for use in conjunction with ammonia absorption refrigerating machines for distilling off the gas contained in the aqua ammonia and thus generating anhydrous ammonia at a cost under 18 cents a pound, has been designed by the Carbondale Machine Co., Carbondale, Pa. This is accomplished without interfering with the operation of the refrigerating machine and does not require the closing of an expansion valve, as in the case of charging with anhydrous ammonia. The economizer is simple in construction and can be placed in any convenient spot in the engine room. Its operation requires no more attention than that necessary in the ordinary charging of anhydrous or of purging. The apparatus and its operation are described and illustrated in a bulletin (No. 17) issued by the company.

The War and the Heating Engineer

Chicago Commission on Ventilation Makes Definite Proposals for Changing Army Cantonment Construction.

A plan to furnish twice as much air space per soldier in the Rockford (Ill.) cantonment for the draft army as is at present proposed has been worked out by the Chicago Commission on Ventilation. The development of the plan was the outcome of the protest made by The American Society of Heating and Ventilating Engineers to the War Department, as reported in last month's issue.

Squad houses, for eight men each, instead of company houses for 200 men each, are proposed by the Chicago commission. Each building will provide 600 cubic feet of air per person.

"In the end," said Health Commissioner John Dill Robertson, "the small buildings will mean economy. If 200 men live together in one large room, it will mean that one man can give 200 men a contagious disease. When there are only eight in a room, at the most only seven can be infected."

Those present at the meeting were Dr. Robertson, William D. Harkins, J. W. Shepherd, Dr. E. V. Hill, Harry Hart, George Beaumont, John Howatt, James Davis, S. R. Lewis, M. J. Sturm, Fred Postel, Dr. C. P. Caldwell, and F. B. De Forest.

Heating Men in Military Service.

Charles L. Collette, advertising manager of the Kewanee Boiler Company, Kewanee, Ill., has been given a captain's commission in the Sixth Company, Infantry Section, Illinois Division of the First Officers' Reserve Corps. He has been training at Fort Sheridan, Ill.

Perry C. Satterthwaite, son of J. N. Satterthwaite, of Satterthwaite Bros., Tecumseh, Mich., heating and plumbing contractors, has been appointed a second lieutenant at Fort Leavenworth, Kan. He is a graduate of the University of Michigan, engineering department.

The following young men connected with the United States Radiator Corporation, Detroit, Mich., have enlisted for war service in the army or navy: Joseph A. Cook, Charles Crute, C. D. Rood, Percy Tuttle, William Wolpel, Harry N. Smith, A. H. Hanson, I. I. Hodes, T. R. Flanagan, John Keightly and G. L. Williams.

H. S. Rumsey, formerly vice-president and general manager of the L. M. Rumsey Mfg. Co., St. Louis, Mo., is now a captain in the First Missouri Artillery. Captain Rumsey is a veteran of the Spanish-American War.

William E. Sloan, Jr., son of W. E. Sloan, of Samuel Sloan & Co., Rochester, N. Y., has joined the Naval Reserves, at Newport, R. I.

M. Stanley Hunting, son of S. E. Hunting, president of the Hunting Co., Watertown and Rochester, N. Y., has been commissioned second lieutenant in the field artillery, having successfully passed the requirements at the Officers' Training Camp, at Madison Barracks, N. Y.

Charles G. Dennison, of the American Radiator Company, Chicago, has been commissioned captain in the new National Army. Herman A. Voss, of the same company, has been made first lieutenant, and Harold Pynchon, second lieutenant. H. L. Whitelaw has joined the Overseas Training Camp for Canadian Reserve Officers, at Toronto, Ont.

W. B. Hutchinson, son of Thomas H. Hutchinson, manufacturers' agent, New York, is a second lieutenant, having been commissioned last year. He is a graduate of Cornell University and has served at the Plattsburg Training Camp during the past few months.

A. W. Clegg, of F. A. Clegg & Co., Louisville, Ky., has enlisted in the Quartermaster's Corps.

Building the Army Cantonments.

Neiler, Rich & Co., Chicago, Ill., have been selected as supervising engineers in charge of the heating for Camp Custer Cantonment, at Battle Creek, Mich. Both Mr. Neiler and Mr. Rich have been on the ground, and Mr. Rich will be located there permanently until the completion of the work.

Sarco Co., Inc., New York, has received orders for temperature regulators for each of the sixteen cantonment camps, as well as for the Selfridge Aviation Field, near

Mt. Clemens, Mich., and for the League Island Navy Yard, at Philadelphia.

An order for 2,000,000 ft. of pipe for government consumption was received by one of the Valley plants near Youngstown, O. Size of the pipe varies from ¾ to 7 in. It will be used to heat the different cantonments. The contract will be filled with the utmost dispatch.

The Home Furnace company, Holland, Mich., has received an order from the United States government for ten carloads of its product to be shipped as fast as they can be manufactured. The furnaces will be used in the army cantonments.

Howard Crook Co., Baltimore, Md., has been awarded the contract for the heating and sanitary equipment of the U. S. Army Cantonment at Charlotte, N. C. The Consolidated Engineering Company, Baltimore, has the general contract.

Stephan Bros., Council Bluffs, Ia., have received the heating and plumbing contract for the seven dormitory buildings and the seven mess buildings of the army cantonment at Fort Omaha. Each of the fourteen buildings is 336 ft. in length. The general contract was awarded to A. Wickham & Co., of Council Bluffs.

L. H. Prentice Co., Chicago, Ill., received a $100,000 government contract for heating the new buildings south of the present naval training station at Waukegan.

Farrell Heating & Plumbing Co., Atlanta, Ga., were awarded the heating and plumbing contracts for the seventh division army cantonment at Atlanta.

M. J. Gibbons Co., Dayton, O., were awarded the heating and plumbing contract for the eighth division army cantonment at Chillicothe, O.

Stone & Webster, Boston, Mass., were given the general contract for the army cantonment at Fort Sam Houston, Texas. This firm handles the entire equipment.

Colonel I. W. Littell is in general charge of all construction work for the new army cantonments each of which covers 1,000 acres of land and has 700 buildings, housing 40,000 men. All mail for the officer in charge of the work should be addressed to the constructing quartermaster of the camp in question.

Directions for Prevention of Fire.

The National Board of Fire Underwriters has prepared for the Council of National Defense and is mailing to a list of some 66,000 of the leading manufacturers of the United States, a booklet of directions for the prevention of fire, under the title of "Safeguarding Industry," together with a show-card of fire prevention rules for employees. Its purpose is to prevent fires in industrial plants which are working under the abnormal conditions of wartime emergency. The directions are brief and to the point and form a valuable contribution to the work of prosecuting the war. Copies of the booklet may be had, without expense, on request, by addressing the National board at 76 William Street, New York.

Recommendations of United States Food Administration.

Among the recommendations of the Bureau of Trade and Technical Press Publicity in connection with the food administration conservation campaign, is one to "save the fuel." "Coal comes from a distance" states the bureau, "and, our railways are overburdened hauling war material. Help relieve them by burning fewer fires. Use wood when you can get it."

Business Men in War Convention.

An emergency call has gone forth from the Chamber of Commerce of the United States to the business men of the country for a great war convention to be held at Atlantic City, September 17-21. It is expected to be the largest gathering of business men ever held and will show to the world that American business recognizes its duty in this crisis and stands solidly behind the government in war.

A principal topic of discussion will be the duty that business owes the government in war. The strongest possible emphasis will be laid upon this. There will come the question of how business of the country may render even greater service in winning the war. This will include what may be done to control prices, how priority may be most quickly and effectively established, how greater efficiency in land and water transportation shall be developed, how we may best provide for and protect our forces on land and sea and those dependent upon them at home, and what steps may be taken for better education of the nation on the issues at stake in the war.

Ways and means by which business must readily adjust itself to the conditions produced by the war will be considered. Also there will come the questions of how we shall provide for business enterprises not essential to the nation in war time, food conservation, its special importance to busi-

ness men, industrial relations and employment problems, and foreign trade, banking and credit in war time.

Of particular interest will be the readjustment after the war for which business must prepare. This will include the question as to what will be the course of prices on raw materials and finished products after the war, how we shall plan for replacing our men in industry after they return from the war, and what new responsibilities in international relations may be expected after the war.

Engineering Council Appoints Committees.

Standing committees on public affairs, rules and finance have been appointed as follows by the Engineering Council which is made up of members of the civil engineers', mining engineers', mechanical engineers' and electrical engineers' societies:

Public Affairs: C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice, Jr.

Rules: J. P. Channing, Clemens Herschel, N. A. Carle and D. S. Jacobus.

Finance: B. B. Thayer, I. E. Moultrop, Calvert Townley and Alex. C. Humphreys.

Many matters coming before the council, both from the several founder societies and from the council's predecessor, the Joint Conference Committee of National Engineering Societies, have been considered and referred to appropriate standing committees for investigation and report.

The council has also created a War Inventions Committee comprising H. W. Buck, A. M. Greene, Jr., and E. B. Kirkby, to co-operate with the Naval Advisory Board and other departments at Washington, if desired, in the promulgation to engineers of war problems now before the government and for which there are opportunities for solution by means of inventions. It also created a committee comprising George J. Foran, E. B. Sturgis, A. S. McAllister and A. D. Flinn, which is to collect and compile such information regarding engineers of the country as will enable the committee to co-operate with the different departments of the Federal government on request and to assist in supplying the government's need for engineering services.

Every effort is being made to secure the co-operation of all engineers, organized or otherwise.

American Efficiency.

Germany efficiency has been held up as a degree of excellence unattainable by a Democracy. The accomplishments of the United States since April 5 last refute the truth of the claim. In the short space of time since that day the United States has accomplished the following:

Declared a state of war as existing between this country and Germany;

Seized 91 German ships and begun repair work on them;

Authorized unanimously a war fund of $7,000,000,000;

Appropriated $600,000,000 for merchant shipping and as much for air fleets;

Agreed to loan our Allies $3,000,000,000 and advanced them a large proportion of that sum;

Passed a selective draft law and in a single day registered nearly ten million men for military service;

Enlisted 600,000 volunteer soldiers in the Regular Army and in the National Guard of the States;

Sent a Commission to Russia to aid Democracy there and a body of railroad men to Russia and another to France to advise and assist in railroad transportation in those countries;

Begun the construction of 32 camps for our soldiers;

Sent to England a fleet of destroyers and to France a detachment of troops;

Authorized and now enforcing embargo whereby our enemies will receive no more food or material from us;

Passed a food conservation law;

Organized many voluntary commissions and boards who are aiding the Government and the people in the speeding up of work, conservation of food, and other national movements;

Drafted by lot 687,000 men for military service;

While the Government was accomplishing these things the American people have loaned the United States $2,000,000,000 and offered $1,000,000,000 more, over four million citizens subscribing to the loan.

In addition they have given over $100,000,000 to the American Red Cross and $3,000,000 to the Young Men's Christian Association.

All these things were accomplished while our soil was not invaded or even threatened with invasion and without any disturbance of business conditions. All was done with the calm determination and judgment of an earnest, patriotic people performing a service for civilization and mankind and maintaining the rights, the dignity, and the honor of the greatest nation in the world.

The German leaders derided America's entry into the war as a bluff. This is our answer.

The German Imperial Government was nearly fifty years in perfecting its military efficiency. In less than four months the American Republic has made such strides as to indicate that in less than two years' time the boasted superiority of German efficiency will have been discredited. There is such a thing as American efficiency, and time will prove that German efficiency cannot withstand it, fighting as it is for liberty, justice, and humanity.

NATIONAL DISTRICT HEATING ASSOCIATION

Committee on National Defense.

Acting on the suggestion of J. W. Lieb, president of the National Electric Light Association, President George W. Martin has appointed a committee on national defense to work with the National Committee on Gas and Electric Service in securing the necessary coal supply next winter and during the continuation of the war. The national committee's headquarters are in Washington. The district heating association's committee is made up of George W. Martin, Secretary D. L. Gaskill, who is also president of the Greenville (O.) Electric Light & Power Co.; and J. C. Hobbs, of the Duquesne Light Co., Pittsburgh, Pa.

Questionnaires will be sent out to the member companies of the National District Heating Association covering their needs and requirements in regard to their coal supply. It is the intention of the bureau not only to see that the companies get an adequate supply of fuel, but also to obtain better shipments and routing and to obtain the lowest possible prices for the various utility companies.

Advancement Committee

As recommended by the retiring president, Byron T. Gifford, in his annual address, a new committee has been appointed, to be known as the Advancement Committee, to determine the possibility of financial gain in central heating work and to study the successful plants. The committee is composed of B. T. Gifford, chairman; A. E. Duram, New York; Charles R. Bishop, North Tonawanda, N. Y.; George H. Alexander, Frankfort, Ind.; D. L. Gaskill, Greenville, O.; George W. Martin, New York; and F. A. Newton, Jackson, Mich.

Increase in Coal Prices from 1915 to 1917.

Interesting figures as to the rapid rise in the price of coal during the past two years is furnished by various district heating companies in correspondence appearing in the bulletin of the National District Heating Association.

One company states that the market price of bituminous coal has increased from $4.50 in June, 1915, to $10.00 in June, 1917 per net ton. The second company reports that the average price for No. 4 washed nut coal was about $3.00 a ton in June, 1915. It is now $5.50 a ton. Screenings have increased $2.00 a ton. The average increase has been from 75% to 80%, the bulk of the increase having occurred during the past year. The third company reported a 50% increase, the fourth, a rise in average price from $1.58 to $3.50. The fifth company stated that screenings have increased in price from 75 cents per ton, on contract, to $3.25 in the open market, and mine run from $1.10 to $3.25. The sixth company gave comparative figures of $1.90 f.o.b. plant switch in June, 1915, and $3.50 in June, 1917, "the same for pea, nut and slack." The last company reported a rise from $2.00 to $3.25, or 62½%.

Increased Labor Costs a Factor in the Agitation for Higher Heating Rates.

Evidence that the need of higher rates for heating service are not based entirely on increased coal prices, is furnished in the reports of district heating companies on the cost of their boiler room labor. In one case the boiler room labor cost increased from 34⅜c. per hour in June, 1915, to 34⅝c. and 37½c. per hour in June, 1917. Approximately 60% of the employees secured this increase.

In another case it was stated that the increase in the cost of boiler room labor is to be found in the increase in the minimum rates of the local building managers' association. These rates have gone up 4c an hour since June, 1915, but as these rates are simply minimum rates, the advance has been greater. It is perhaps fair today that the advance has been about 20%.

One company reports an increase of 33%. The prices in 1915 were: Firemen (70 hours per week) 30c an hour; firemen helpers (70 hours per week) 25c per hour; laborers, 20c per hour. In 1917 they are: Firemen (60 hours per week) $95.00 per month; firemen helpers (60 hours per week) $80.00 per month; laborers, 25c per hour.

Wages paid by another company compare as follows: June, 1915: Firemen (12 hours per day) 23c per hour; firemen helpers (12 hours per day) 20c per hour; laborers (10 hours per day) 22½c per hour. In 1916, the prices were: Firemen 34c, firemen helpers 30c, laborers 30c. In 1917 the following wages prevail: Firemen (8 hours per day) 41c per hour; firemen helpers, (8 hours per day) 36c per hour; laborers (8 hours per day) 35c per hour.

How Much Must Heating Rates Be Increased to Meet Present Costs?

It is well-known that all of the central heating companies are face to face with the necessity of immediately increasing their heating rates to meet the present cost of coal, labor and supplies. Just how much an increase is necessary, however, is not so clear. Much light is thrown on this phase of the problem by the action already taken in a number of cases reported in the National District Heating Association's Bulletin for July, 1917.

Company A states that an increase of 35c per 1,000 lbs. of steam will be necessary to meet the increased production cost. Company B thinks 20c will be sufficient. Company D sells its heat on a flat rate basis and has not arrived at a decision. Company G estimates that the rates should be increased 25 cents.

A typical example of the revision of the heating schedules is furnished by Company A as follows:

Old Schedule.

	Per 1,000 Lbs.
First 10,000 lbs. steam per month	$1.00
Next 10,000 lbs. steam per month	0.90
Next 10,000 lbs. steam per month	0.80
Next 20,000 lbs. steam per month	0.70
Next 40,000 lbs. steam per month	0.60
Next 250,000 lbs. steam per month	0.50
All over 340,000 lbs. steam per month	0.40

New Schedule.

	Per 1,000 Lbs.
First 10,000 lbs. steam per month	$1.50
Next 10,000 lbs. steam per month	1.25
Next 20,000 lbs. steam per month	1.00
Next 40,000 lbs. steam per month	0.75
Next 920,000 lbs. steam per month	0.60
All over 1,000,000 lbs. steam per month	0.55

In the case of Company B the increase takes the form of a schedule which is about 20% higher than the old schedule. The old schedule of rates for general business was:

$1.50 per 1,000 lbs. for the consumption up to and including 10,000 lbs. in any month.

$1.00 per 1,000 lbs. for the excess consumption in such month over 10,000 and up to and including 20,000 lbs.

$0.80 per 1,000 lbs. for the excess consumption in such month over 20,000 and up to and including 30,000 lbs.

$0.70 per 1,000 lbs. for the excess consumption in such month over 30,000 and up to and including 80,000 lbs.

$0.60 per 1,000 lbs. for the excess consumption in such month over 80,000 and up to and including 200,000 lbs.

$0.55 per 1,000 lbs. for the excess consumption in such month over 200,000 and up to and including 400,000 lbs.

$0.50 per 1,000 lbs. for all excess consumption over 400,000 lbs.

The new schedule is as follows:

$2.00 per 1,000 lbs. for the consumption up to and including 10,000 lbs. in any month.

$1.30 per 1,000 lbs. for the excess consumption in such month over 10,000 and up to and including 20,000 lbs.

$1.00 per 1,000 lbs. for the excess consumption in such month over 20,000 and up to and including 40,000 lbs.

$0.80 per 1,000 lbs. for the excess consumption in such month over 40,000 and up to and including 100,000 lbs.

$0.70 per 1,000 lbs. for the excess consumption in such month over 100,000 and up to and including 300,000 lbs.

$0.60 per 1,000 lbs. for all excess consumption in such month over 300,000 pounds.

Both schedules are subject to a discount of 10% for prompt payment.

Company C states that its old schedule is as follows:

$1.50 per 1,000 lbs. for the condensation registered in each month up to and including 4,000 lbs.

$0.50 per 1,000 lbs. for the excess condensation registered in such month over 4,000 lbs. and up to and including 104,000 lbs.

$0.45 per 1,000 lbs. for the excess condensation registered in such month over 104,000 lbs. and up to and including 304,000 lbs.

$0.40 per 1,000 lbs. for the excess condensation registered in such month over 304,000 lbs.

The above rates are subject to a discount of 10% if bills are paid at the company's office within ten days after their date. Minimum bill, $40.00 net per customer per season.

Company E states that it has in mind petitioning for a surcharge to be added to each bill rendered. Its present schedule for hot water heating is at the rate of 20c per square foot of required radiation. The flat rate for steam heat is 25c per square foot of required radiation and the meter rate on steam heat averages 46c per 1,000 lbs. for the first 100,000 lbs. condensation and 35c per 1,000 lbs. for all condensation used over and above the 100,000 lbs.

Comparative schedules are submitted by Company G as follows:

Old Schedule.

First 5,000 lbs. condensation, per month, $0.70 per 1,000 lbs.

Next 5,000 lbs. condensation, per month, $0.65 per 1,000 lbs.

All over 10,000 lbs. condensation, per month, $0.50 per 1,000 lbs.

Less 10% discount.

New Schedule.

First 50,000 lbs. condensation per month, $1.00 per 1,000 lbs.

Next 50,000 lbs. condensation per month, $0.90 per 1,000 lbs.

Next 100,000 lbs. condensation per month, $0.80 per 1,000 lbs.

Next 200,000 lbs. condensation per month, $0.75 per 1,000 lbs.

Next 400,000 lbs. condensation per month, $0.70 per 1,000 lbs.

All in excess of 800,000 lbs. condensation per month, $0.60 per 1,000 lbs.

Less 5% discount.

Company E sent in the following tabulation showing the percentage of increase of prevailing prices over normal prices, in operating expenses, computed from the reports of a large number of utilities:

	Per Cent of Increase over Normal Prices
Coal	194
Labor	33
Miscellaneous Supplies	66
Taxes	48
Equipment	51
General Operating	46

N. D. H. A. Notes.

R. D. DeWolf, of the Rochester Railway & Light Co., a former president of the National District Heating Association, is on war service with the naval forces, in which he holds the commission of lieutenant.

Fred B. Orr, of the Illinois Maintenance Co., Chicago, is also a lieutenant in the naval forces and is on active service on the Atlantic.

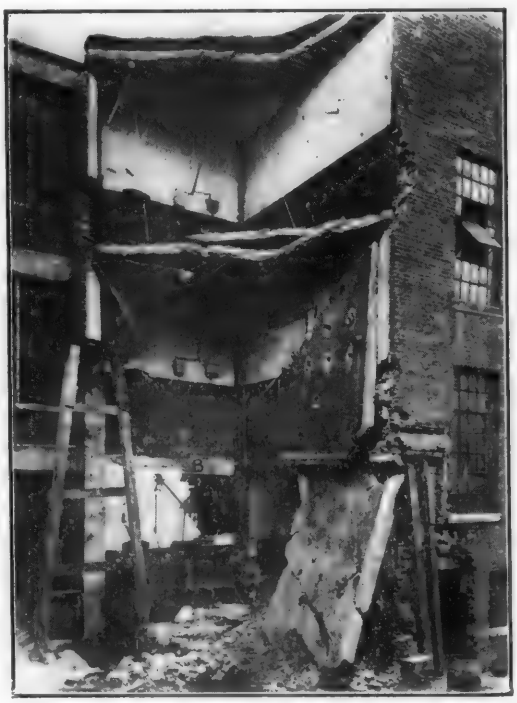
Explosions of Hot Water Heaters And Storage Tanks.

By Heating Engineer

Occasionally one's attention is drawn to explosions of hot water heaters of different kinds. But such explosions have invariably been proved to be the result of frozen pipes, or a hermetically sealed system, combined with the powerful force of expansion due to the application of heat when the system was so sealed.

Such accidents are easily explained. Suppose, for instance, the weather is severely cold. The fire in a hot water heating system has been neglected. The water cools down during the night, and the expansion pipe between heater and expansion tank becomes frozen. The attendant pushes up the fire in the morning, ignorant of the fact that the expansion pipe is frozen. Then an explosion of the heater may, or may not, occur. This is what happens.

The water being heated expands within the system, which is composed of heater,



Courtesy of Power, N. Y.

FIG. 1—RESULTS OF HOT WATER TANK EXPLOSION IN WORKS OF HUDSON MOTOR CAR COMPANY, DETROIT.

piping, and radiators. If there is no air in the system, every part being completely filled with water, then the force of expansion is immediately directed upon every square inch of its internal surface. This force is so great that the metal comprising the heating system cannot resist it. And it is felt by the system long before the water reaches its boiling point. Such a system can be burst while the water is only lukewarm, and the burst will not be in the form of an explosion. It will just split the weakest casting, and the water resulting from the expansion will ooze out slowly as the water heats. And should the water cool again before the frozen expansion pipe is thawed out, the shrinking of the water due to cooling will suck air in through the crack.

RESULTS WHEN SYSTEM IS AIR-TRAPPED.

But how different it is when there are air pockets in the system. The trapped air becomes compressed by the expansion of the water, the pressure increasing as the air is compressed. In reality the system is then the same as a closed expansion-tank system, but without a relief valve. It is like a steam boiler without a safety valve. If the water expansion, during heating up to the boiling point, does not increase the pressure sufficient to burst the system, heat becomes stored in the water until steam is produced. Then the pressure rises materially. Ultimately it exceeds the resisting power of the weakest part of the system. If a radiator is the weakest part, it gives way; then a blow-out, causing water and steam damage in the building, may be expected. But if the heater is the weakest part, and if it ruptures, not in a small blow hole, but in the separation of a section, then a real explosion will be the result.

The energy stored in the highly-heated enclosed water will spend itself on its sursoundings. If the rupture is such that the energy is spent instantly, as in the separation of a heater, the explosion will be violent. If it is such that the expenditure of energy is distributed throughout a considerable period of time—say a minute, as by a broken radiator section—the rupture is not called an explosion but just a blow-out or burst.

A similar thing applies to powder. Take a pound of powder in a tin can and touch it off. An explosion is the result because its energy is spent instantly. But run it out along the ground in the form of a train, and touch off one end. There will be no explosion, for the force of the powder is not all exerted at the same instant.

But it is an exceedingly unusual occurrence for a hot water storage tank, heated by a thermostatically-controlled steam coil, to explode violently. If hermetically sealed it might rupture and leak by the force of water expansion, but this is not likely by actual steam expansion.

A peculiar accident of this kind is reported to have occurred recently, a notice of which appeared in *Power* as follows:

"The illustrations show the results of a hot-water-tank failure which occurred at the works of the Hudson Motor Car Co., Detroit, at 4:17 a. m. on Mar. 26. The tank was 45-in. diameter by 72-in. long and was suspended from the ceiling of the first floor of a three-story brick building with reinforced-concrete floors. The shell was made from 3/16-in. steel with heads of 5/32--in. steel, and all the seams were welded by the oxyacetylene process, but were apparently

Courtesy of Power, N. Y.

FIG. 2—REMAINS OF HOT WATER TANK.

done in a poor manner. Vessels used for this purpose do not come under any regulations in Detroit.

"In Fig. 2 the head marked A in the illustration seems to have failed from sheer fatigue in the welding. The dish of the head could not be ascertained, but was said to be about 3 in. This tank had a closed coil of pipe for the purpose of heating the water contained in it and furnished water to the lavatories. It had a temperature regulator and was supplied directly with water from the mains, the pressure in the mains never exceeding 35 lb. A large number of the bib-cocks in the lavatories were constantly leaking, so that it was rather difficult to believe that any elevation of pressure could occur in this tank, although the supply pipe was fitted with a check valve. It is doubtful if the temperature of the water in the tank greatly exceeded that corresponding to the pressure in the mains, which would be from 260 to 270 deg. The tank was also fitted with a relief valve, which was found to be operative after the accident.

"It will be seen from the crumpled end of the tank that it was projected with con-

siderable force against the 12-in. brick wall at B, Fig. 1, where it tore a hole through the wall and struck a 60-in. flywheel, wrecking it, and at the same time tearing the tank C, Fig. 2. After wrecking the wheel there was sufficient energy in the tank to wreck an 8-in. tile wall which surrounded the compressor room. The wrecked wing of the building was in a court or passageway about 30 ft. wide between buildings. At the initial failure some windows directly opposite the tank were pushed in, but after the equalization of pressure, windows higher up were drawn out and broken."

Power has given a very definite description of the facts as they appeared, but it would be interesting to know the steam pressure carried in the coil and the temperature of the tank water at the time of the explosion. Such data, however, are usually unobtainable in cases of this kind.

We are inclined to believe that the welding was defective, but cannot understand how both ends should be blown out. If one end is blown out of a cylinder, the cylinder may be projected through space like a rocket, but when both ends are blown out, then it would appear that the ends would fly through space while the cylinder stayed in place.

And then when we consider the fact that several factories recently have been afflicted with incendiary bombs—does it not appear from the great damage done to the building that some miscreant may have caused an explosion near the tank which wrecked the building, and started the tank seams, thereby allowing the internal pressure to break loose and complete the tank's destruction?

A bomb explosion great enough to blow out the walls of the building might be powerful enough to drive the tank through the wall and destroy it, as described. The writer would value the opinions of some of the practical readers of THE HEATING AND VENTILATING MAGAZINE on this matter.

The Process of "Spellerizing" as Applied to Pipe.

The form and chemical composition of matter are well-known to be distinct properties. For example: Fig. 1 represents carbon in the form of coke; Fig. 2 represents the same material in the form of a diamond. The diamond, due to the tremendous pressure to which it has been subjected, is practically pure carbon bearing no outward resemblance to carbon in the form of coke, coal or charcoal. Metals undergo changes almost as remarkable if subjected while hot to certain heat treatment and mechanical manipulations.

Commercially pure iron is produced in several forms; puddled iron, knobbled charcoal iron, so-called ingot iron and soft welding steel have much the same chemical composition as commercial products but may differ considerably in physical properties and durability according to the treatment given in process of manufacture.

Uniformity, both as to chemical composition, density and character of structure and finish have been demonstrated to be the most important factors governing corrosion in pipe. The actual chemical composition of the iron or steel has been demonstrated to be of comparatively little importance provided it is not unduly variable in the same piece.

In so far as pipe is concerned, with which

Fig. 1—Carbon in Form of Coke.

Fig. 2—Carbon in Form of Diamond.

this article is particularly concerned, thorough investigation and research have shown that the greatest danger from corrosion occurs to the smaller sizes of pipe, owing to the thinner walls. The larger sizes with thick walls are made from heavy plates of such uniform quality that corrosion does not seriously affect them to any appreciable extent.

To overcome the tendency to corrosion in the smaller sizes a process has been evolved, known as "Spellerizing." This is technically defined as follows:

"Spellerizing is a process of treating metal which consists in subjecting the heated bloom to the action of rolls having regularly-shaped projections in their working surfaces, then subjecting the bloom while still hot to the action of smooth-faced rolls and repeating the operation, whereby the surface of the metal is worked so as to produce a uniformly dense texture better adapted to resist corrosion, especially in the form of pitting." Inasmuch as this process is entirely mechanical and does not in any way depend upon skilled labor, beyond keeping up the machinery involved, uniform treatment is assured.

The Spellerizing process is applicable to the smaller sizes of pipe—say, 4 in. and under—although it is possible in special cases to Spellerize pipe a few sizes larger.

As a matter of homely fact, the process

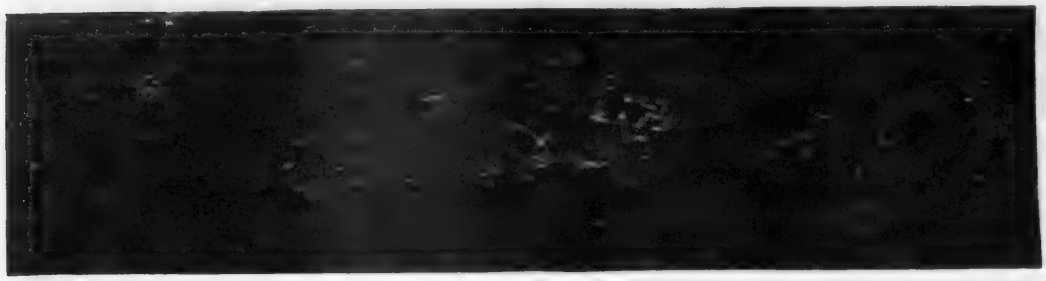


Fig. 3—Sample Wrought Iron Pipe immersed in running mine water in West Pennsylvania Coal Mine. Comparative loss by corrosion—Wrought Iron, 100%; Spellerized Steel Pipe, 73%.

Fig. 4—Sample Spellerized Mild Steel Pipe immersed in running mine water in West Pennsylvania Coal Mine, side by side with Fig. 3.

of Spellerizing metal may be considered analogous to the kneading of dough from which bread is made. Dough is kneaded to produce a smooth, uniform texture; to facilitate the escape of confined gases, which would form air holes and other irregularities in substance and on surface, and to make an even grain and fine, smooth surface Much the same results are obtained by Spellerizing steel.

There are other factors such as contact with other materials which are electro-negative to iron, such as carbon or oxide of iron, or electrolysis due to stray currents which will cause local failures no matter how carefully the steel is made.

Pipe has been made by this process for ten years in increasing amounts. It is significant to note that official records of the American Iron and Steel Institute show that during this period steel tubes and pipe have increased from 74.3% of the total production in 1906 to 87.9% in 1916.

New Spellerizing steel pipe and new wrought-iron pipe considered best by master mechanic of large Western Pennsylvania coal mine were submerged in running mine water side by side, but insulated from each other. Figs. 3 and 4 show the uniform corrosion of specially-worked pipe steel as compared with irregular corrosion and pitting of wrought-iron pipe.

American Public Health Association will hold its annual meeting in Washington, D. C., October 17-20, 1917.

Reminiscences of an Engineer.

BY WILLIAM J. BALDWIN.*

My first acquaintance with steam apparatus was in 1854 when a 2-in. elbow and nipple from an exploded boiler, at the sectional dry dock in East Boston, came through the school house window. We investigated the occurrence, that is, the teacher and I, and ever since that time I have felt that I am able to qualify as an expert in 2-in. fittings.

My father was a British naval architect and I was desirous of being a naval architect, being of a race of sailors on both sides. Such was my youthful ambition, either to be a ship builder or a ship master and Boston was a good place, in those days, to acquire a knowledge of ship building. I will say that I commenced to study shipbuilding when I was 10 years old by spending my Wednesday and Saturday afternoons in the ship yards of East Boston and my Sunday afternoons on the Grand Junction Wharf, in East Boston.

Here the great clipper ships of those days fitted and refitted, such as the Dauntless, the Flying Cloud, the Sovereign of

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*Mr. Baldwin has the distinction of being known as the dean of the heating profession in the United States. As the author of a number of works on heating and ventilation, including "Baldwin on Heating," which ran through fifteen editions, he has provided many of the leading engineers of to-day with the basis of their training. He is an honorary member of The American Society of Heating and Ventilating Engineers.

the Seas, the Red Jacket and the Blue Jacket, the Donald McKay and the famous Great Republic, the latter being the first four-masted ship ever built and the largest in her day. She was launched in the Fall of 1854 from the yard of Donald McKay, who was the greatest sailing ship builder the word has ever produced and was known as the "Prince of Shipbuilders."

Tetlone, Curtis and McKay, all great shipbuilders and famous, had ship yards in the third section of East Boston, just across the river from the Charleston Navy Yard. This was the atmosphere in which the boy acquired his love for ships. From the slope of the hill, just below the reservoir, I watched the launching of many famous clipper ships, and it was from this eyrie that I also saw the launching of the famous ram, the Merrimac, about 1856. She was then known as the beautiful U. S. Sloop-of-War Merrimac, built at the Charleston Navy Yard, almost at the foot of the Warren Monument, and within sight of Bunker Hill.

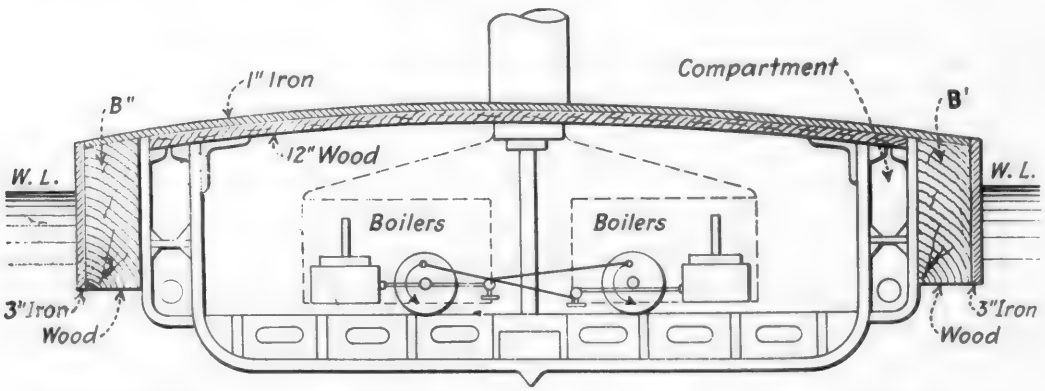
The Merrimac was a beautifully-modeled full-rigged ship, with auxiliary steam propulsion; that is, she could draw her propeller out of the water into her stern-well and could then be operated as a sailing ship. There were several like her, all beauties in model, but unable to carry their armament of twelve big guns when in a sea-way. To distinguish a sloop-of-war from a frigate, the former has her guns on the main deck and, in this case, the guns were too heavy for the ship. The metacenter was too high with the guns on board.

This circumstance explains why the Merrimac was at the Norfolk Navy Yard when the Civil War broke out. The commandant ordered her destroyed but, unfortunately, some one opened the sea cocks, as well as setting her on fire. So she sank and extinguished the fire and was saved to the Southerners who raised her and made her into an "ironclad."

The famous engagement of the Merrimac and the Monitor is too well-known to call for special comment. Speaking of the monitor type of vessel, however, I had the honor of helping to construct three monitors in the yard of Donald McKay, the Casco, Squando and Naussett. The Nahant, which lay in the Narrows in the harbor of New York, during the Spanish-American war, was a vessel of this type.

When the Civil War was in its first year, I was a draftsman and apprentice with Donald McKay. Eben Hodge, James Hodge and James Gardner were his engineers when he turned from wooden ship building to making and repairing and altering war ships for the United States government.

In this school I received my training up to the time of the close of the war. The drafting room was too quiet for me. I James Hodge, the superintendent, to give wanted to make something and I asked me a job on the outside. He hesitated at first on account of what he considered my frailness, but he changed his mind afterward and I was the last man in the employ of Donald McKay, in the yard, when the war ended.



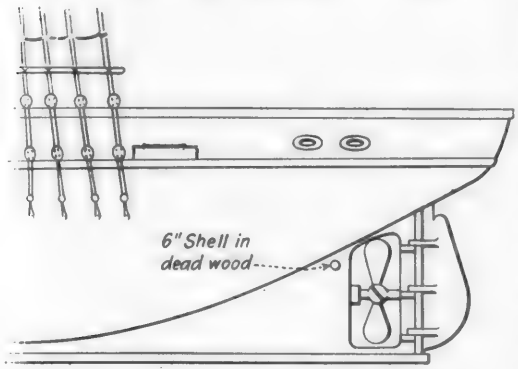
CROSS-SECTION OF THE "MERRIMAC" TYPE OF RAM OF CIVIL WAR DAYS.

Perhaps one of the most interesting experiences that fell to my lot, while in the yard, was the altering of the blockade runners into United States cruisers. These beautiful steel blockade runners, built by Laird and others in England, would be captured and sent in, and it was our duty to make cruisers of them in the shortest time possible, say two months.

Their rails were taken off and the stanchions pieced out until there was a space of from 7 to 8 ft. in the clear, "'tween decks," that is, between the old main deck (all they had originally) and the upper deck which we put on. This made room for officers' quarters and armament on the

main deck and gave ample room for fuel, storage, crews' quarters and magazines below, with roomy, ample and airy quarters on the main deck, while the upper deck was left free for working the ship.

These beautiful models were made of light draft for navigating the waters of the Bahama Islands and Bermuda and our own shallow, southern coast, and so that they might run in through back-ways and by-ways or creeks and land their sulphur, saltpeter, guns and munitions so much required by the South, and get out with a cargo of cotton, piled until their decks were awash.



LOCATION OF 6-IN. PERCUSSION SHELL IN STERN POST OF U.S.S. KEARSARGE.

They carried coke for firing on our coast so as to show little or no smoke, but the peculiar noise made by their feathering paddles was enough to locate them in fine weather. In 1866 I found these vessels in South America as coasting liners. They were good sea boats and many of them were used by Brazil as transports during the Paraguayan War.

An incident of which I was a witness, connected with the closing of the Civil War, was the taking of a 6-in. percussion shell from the stern-post of the U. S. S. Kearsage after her battle with the Alabama, in which she sank the latter. It is a conical, fluted 6-in. shell and is now in the Smithsonian Institute in Washington, but its charge has been withdrawn. A circle of deep auger holes was bored around it and it was withdrawn in its matrix of wood. Had the matrix been preserved, as well as the shell, it would have better preserved the story of the immortal Winslow and the close call of the Kearsage in that memorable fight off the French coast.

New Air Measuring Instruments.

So much interest has been aroused by the mention of the new air measuring instruments, in the report published last March of George T. Palmer's address before the New York Chapter of the heating engineers' society, that we present herewith a more detailed description of these devices.

THE ATMOMETER, AN INSTRUMENT FOR MEASURING THE DRYING POWER OF THE ATMOSPHERE.

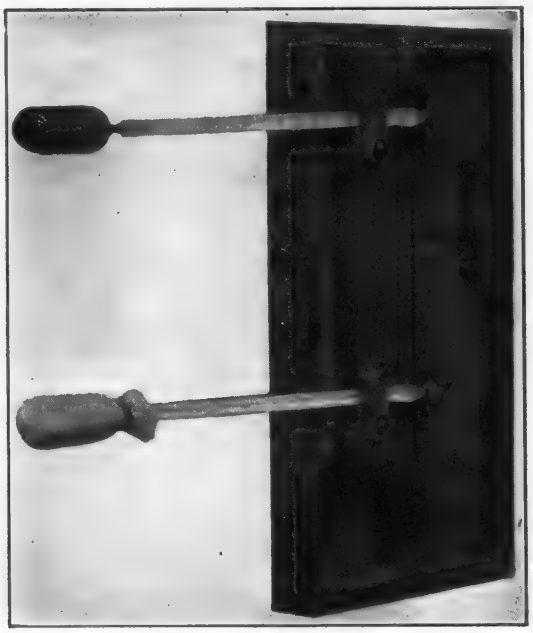
This device consists of a finger-shaped porous cup, about 5 in. long, attached to a glass U-tube, one arm of which is graduated in tenths of a cubic centimeter. The apparatus is set up by filling the cup with distilled water, to which a trace of copper sulphate has been added, to prevent the growth of moulds and small plant life. The capillary arm of the U-tube is then inserted in the cup, the arm being filled with water up to the stop cock. These parts are held together by the rubber stopper which makes a water-tight joint.

The instrument is now inverted with the porous cup uppermost, the graduated arm

THE ATMOMETER, FOR MEASURING THE DRYING POWER OF THE ATMOSPHERE.

of the U-tube filled with water and, on making sure that no air bubbles have been caught, the instrument is ready for use. Ample time should be given for the water to make its way through the porous cup before observations are taken.

As water evaporates from the surface of the porous cup, more water is drawn up through the capillary arm to take its place. The amount evaporated in a given time is read off directly from the water level in the graduated arm.



THE KATA-THERMOMETER

For Measuring the Combined Effect of the Three Methods by which Air Extracts Heat from a Hot Object—Radiation, Convection and Evaporation.

This instrument is useful in measuring the relative drying effects of air at various temperatures, humidities and rates of air movement. It should be borne in mind that the absolute quantity of water evaporated is, of course, dependent on the size, shape and material of the porous cup and of its temperature.

Each cup is standardized by the makers against a cup in their possession and the product of the amount of water evaporated from any cup and its coefficient gives results comparable for all cups. This cup has been used by horticulturists in studying the effect of dryness and moisture on plant growth and its use is described in a paper entitled, "Atmometry and the Porous Cup Atmometer," by B. E. Livingston. This paper and the cup may be secured from *The Plant World,* Tucson, Arizona. The particular U-tube connection shown in the photograph was devised by the New York State Commission on Ventilation and is used in studying dryness as related to ventilation.

THE KATA-THERMOMETER.

This instrument measures the combined effect of the three methods by which air extracts heat from a hot object—radiation, convection and evaporation. It consists of two glass bulbs, shaped as in the photograph, and filled with a colored spirit. The necks of the bulb are graduated in degrees Fahrenheit from 95 to 100. The bulbs are placed in hot water until the spirit column rises well above the 100° mark. The bulb without the cloth covering is then dried and either placed in the rack provided or suspended in the air on a string. The bulb with the cloth covering is gently shaken to remove excess water and then exposed similarly to the dry bulb.

Both bulbs lose heat to the surrounding air and their rate of losing heat is measured by timing the spirit column in its fall from 100° to 95° F. Each bulb possesses a coefficient which is divided by the time of fall in seconds and the quotients thus obtained, when added together, express the heat-extractive power of the air in terms of calories per square centimeter per second.

The kata-thermometer is useful in measuring the deheating effect of the atmosphere during the time the reading is being made. It is not possible with this instrument, however, to follow the slight fluctuations in deheating effect which are constantly occurring. Prof. Phelps, of the New York State Commission on Ventilation, has attempted to meet this situation with a wet-bulb thermometer to which a constant amount of heat is supplied through an electrically-heated coil. If the heat production is constant then any change in the rate of heat loss must show itself in the actual temperature of the instrument. If the air temperature and relative humidity are high and the air movement is slight, the rate of heat loss from the heated bulb will be slow and, inasmuch as the amount of heat supplied does not change, the mercury column on the thermometer will rise up to a point where its rate of heat supply and heat loss is balanced. Heat is thus being stored up in the instrument.

In a cold atmosphere heat is taken away from the bulb about as quickly as received and the mercury column does not get an opportunity to rise. The fluctuations in rate of heat loss may then be determined by reading the mercury column at intervals or by fitting up a bulb on a recording

psychrometer and thus obtaining a continuous inked record of the heat loss changes.

This type of instrument has been named the "Comfortmeter" as it measures, in a way, the degree of comfort which air produces. It is the rate of heat loss from all causes that determines body comfort and this instrument as does the kata-thermometer, measures not merely the temperature of the air alone, not merely its relative humidity, not merely the velocity and constancy of air movement, but the combined effect of all three.

Two forms of the "Comfortmeter" have been used by the Ventilation Commission in its work. This instrument, however, is in an early stage of development and any further details of construction are without special interest at this time. The significance of the readings and the form of scales used must also await further experience for interpretation. The kata-thermometer was designed by Dr. Leonard Hill, of London. It is manufactured and sold in this country by the Fiebe-Gorman Co., Monadnock Block, Chicago, Ill.

Publicity for the Heating Engineer.

Under the title of "Simple Plan for Dehydrating Food is Discovered by Engineer," the New York Globe, in its issue of July 26, featured the drying session of The American Society of Heating and Ventilating Engineers, at its recent meeting in Chicago, lays special emphasis on the suggestion made by Walter L. Fleisher, of New York, at that meeting, that the heating and ventilating plants in public school buildings be utilized, during the summer months, for drying fruits and vegetables. The article is written by Alfred W. McCann, the well-known food expert.

The article, in part, is as follows:

Walter L. Fleisher, a "heating and ventilating engineer" of New York City, is the father of an idea which promises, if acted upon by the fathers of the government at Washington and the various state and city fathers who dwell in every voting centre of the United States, to revolutionize the canned food industry.

Walter Fleisher is a member of The American Society of Heating and Ventilating Engineers. It was at a meeting of this Association at the La Salle Hotel, Chicago, recently that he justified his existence for all time by proposing an idea so simple, and yet so rich in possibilities, that it promises to upset all the existing notions on the subject.

Fleisher for three or four months has been doing experimental work in dehydration for the Westchester Association, now operating some dehydrators at White Plains, the mayor's committee and the Department of Agriculture. Like all other engineers honestly interested in their work, he has found that there is really nothing new either in the methods or in the products, and has said it so bluntly and sincerely.

"The main trouble with the whole proposition," said Fleisher to his fellow engineers, "has been that we have never attempted to use the apparatus and plants already at hand. We have always been balked by the objection of cost. The thing is too expensive to be practicable, say any number of interested people.

"Yet the facts are that the things needed for a successful dehydrating plant are a large blower or fan, a steam radiator or heater to warm the air, a boiler for generating heat for the radiator, a sheet-iron tube to carry the heated air to the drier, and a method of regulating temperature, either by hand or with a thermostat.

"In every modern school building in America as well as in every modern public building, there is a modern heating and ventilating apparatus. Municipal buildings, state buildings, federal buildings, have been erected with these modern heating and ventilating plants all over the country.

"In every one of these institutions is tucked away an ideal dehydrating plant which is never used. Many of these buildings are practically shut tight during the very months of the year in which our perishable foods are marketed. I propose that in every school conveniently located, as well as in every state or federal building of the same character, in which a modern heating and ventilating plant is now installed, some room near the source of supply of heat ought to be turned into a dehydration.

"This can be done with very small expense, and the heat, thermostatically controlled, can be brought from the fan to this drying room, and there applied for the proper dehydration of any of the fruits or vegetables which the community might have for preservation."

Mr. Fleisher stated that he would be not only willing to take any school building in New York City and design the necessary changes that would convert one of its rooms into a community dehydrating plant, but that he would enthusiastically embrace the opportunity.

CORRESPONDENCE

The Development of Temperature-Controlling Apparatus.

EDITOR HEATING AND VENTILATING MAGAZINE:

Large buildings under construction are now, as a rule, equipped with an automatic heat-regulating system, such as the Johnson or Powers method of compressed-air control. In old buildings, however, these compressed-air systems are rarely installed, because of the cost and inconvenience which would result from the tearing up of floors and plaster in order to lay the air pipes. Thus, the heat in these buildings is allowed to run wild, to the great discomfort of the occupants.

Can you tell me why it is that a suitable electric system of heat control has not been developed to meet this demand? I have made considerable investigation to ascertain why an electric system has not been developed and have come to the conclusion that the difficulty lies in obtaining a suitable electric valve which will perform the same functions as the rubber or metal diaphragm in the compressed-air system. Can you advise me as to the correctness of my conclusion?

In an electric system, a single transformer could furnish sufficient low-voltage current from the 110-volt lighting circuit to supply the entire building. The current could be carried around the main walls by a single small pipe or conduit, over the molding in the hall, and the voltage and current could be made sufficiently low to enable the leads from the main conduit to the rooms to be laid bare and still not violate the rules of the electric code. Thus no tearing up of floors or plaster would be necessary.

There is also a big demand for an electric system in large apartment buildings. The hot water or steam piping could be so arranged that a single valve, controlled by a single thermostat within each apartment, would control the heat of that apartment. Also the radiation surface of the radiators in the most exposed apartment of the building could be made a little smaller than those of the other apartments so that if the exposed apartment obtains enough heat, the other apartments would also. A second thermostat in the exposed apartment would control the drafts of the furnace, in conjunction with the safety valves of the furnace, thus making the entire building automatically controlled.

L. R.

Our correspondent is quite correct in saying that there is a good field for automatic control in buildings already erected, and yet this field is not as large as might readily be supposed. There has never been any argument made against the desirability of automatic control of all heating devices and systems, no matter where placed or how operated, but to develop such control so as to be economical to install, positive in action and dependable at all times has not been so easy.

There is, however, a method of electrical control which has been developed by the Gold Car Heating & Lighting Co., of New York City, for use on car heating apparatus where the steam pressures run anywhere up to 100 lbs. The fact that this apparatus gives satisfactory operation under such pressures and when constantly subjected to the jolting of the car indicates its practicability. This system utilizes direct electric current, usually at 110 volts and consumes between 5 and 10 watts of current, according to the steam pressure. A similar apparatus to work on alternating current has not yet been perfected and, therefore, the voltage could not be handled by a transformer, as suggested, as a transformer will supply only A. C. current. Neither could sufficient force be obtained to operate the steam valves economically unless a voltage much higher than that suggested by our correspondent be used. In other words Underwriters' rules would have to be followed in the installation of wiring.

The electric thermostat for this system is simply a switch operating the magnet valve which consists of a solenoid which, when energized, forces the valve stem down and closes the valve. When de-energized a spring raises and holds the valve open the same as in the ordinary pneumatic system.

The original Johnson system was also electrical in so far as the thermostat was concerned, this controlling a pneumatic valve on the air line by means of a swinging armature which was turned by the energizing of adjacent magnets so as to throw the air on and off the pneumatic line. These thermostats operated such small valves that it was possible to use a current from a series of bell batteries but the danger of running out these batteries by an accidental short circuit, the constant wearing out of the batteries from excessive operation during cold weather (thus throwing the control of the whole building out) and the trouble experienced when these batteries were neglected led to the abandonment of this system.

Another control manufacturer who does not yet make such an electrical control states that it would be entirely feasible to

develop such a system and believes that in the end it will be simpler and less troublesome than the compressed air lines but adds that no one to his knowledge has commercially developed such a system which is an *entire* success. He also states that large thermostatic control installations are almost invariably made for direct electric current which it is impossible to handle from a transformer and that it would probably necessitate the use of a motor generator.

It must be remembered that in buildings erected outside of schools, office buildings and others of a public nature the architect, builder, speculator or other individual most intimately concerned is possessed of a strong desire to make a showing with a low first cost and that for this reason automatic control has been, and will continue to be, omitted from a great many buildings where its use would be most beneficial, and where its installation would undoubtedly show a considerable saving on the operating end.

Condensation in Engine Cylinders and Its Bearing on Exhaust Steam Heating.

EDITOR HEATING AND VENTILATING MAGAZINE:

In THE HEATING AND VENTILATING MAGAZINE for May, (page 53), you published a reply to some questions in regard to heating by exhaust steam. At the end of this reply (bottom of first column, page 54), you give an analysis of the amount of heat subtracted from the steam in the process of passing through the steam engine.

I would respectfully call your attention to the fact that your analysis is incorrect in that you have neglected the fact that part of the heat converted into work in a steam engine is supplied by actual condensation of the steam, so that, under ordinary conditions, the exhaust steam which leaves the engine is not dry steam, but contains a certain amount of moisture. That this is true can be easily proved from your own figures. For instance, according to these figures, each pound of steam gives up 38 B. T. U. Since the engine is rated at 40 lbs. of steam per H. P. hour, this gives 1520 B. T. U. per H. P. hour furnished by the steam. Since one H. P. hour is equivalent to 2545 B. T. U., this would give the engine a mechanical efficiency of something like 170%. The answer is, of course, as stated above, that not all of the heat necessary for producing work in the engine cylinder comes from the reduction in pressure of the steam, but part of it comes from actual condensation of the steam itself.

Hartford, Conn. B.

Our correspondent is quite correct, but he will note that we stated:

"On account of small losses in the engine and the possibility of slightly higher condensing ability in some parts of the system we could not recommend over 95% of the above, say 11,400 sq. ft. for cast-iron surface, or 9,500 sq. ft. for pipe coil surface."

The small losses referred to mean the condensation and radiation losses occuring in the cylinder. We were also careful to say "*about* 4,000 lbs. of steam would be available" as the pounds of exhaust could not *quite* equal the pounds of steam supplied. Actual experiment has proved that only 4% more steam is required to operate an engine, than to pass it through a reducing valve and not operate the engine, both producing thermally the same heating effect after their passage. Therefore, a thermal efficiency of 96.8 seems pretty nearly correct, for on this basis if it took 100 lbs. of steam at high pressure to do a certain heating work it would take 104 lbs. supplied to an engine to do the same heating work after passing through the engine. In the case in question, with the steam passing through the engine, say it takes 104 lbs. Then, if our thermal efficiency figure is correct, 104 × 96.8% thermal efficiency must equal the actual heating effect of the exhaust; in reality it does equal 100.672 lbs. or about as close as theoretical figures can be made to check with actual experiments.

Our correspondent has raised a most interesting question, however, regarding the B. T. U. utilized in the engine and the matter of condensation in the engine cylinder. While space limitations will not allow us to undertake a detailed discussion of engine cylinder losses we would refer our reader to a paper by David Moffatt Meyers read before The American Society of Heating and Ventilating Engineers in 1915 on the "Heating Value of Exhaust Steam." In this discussion a chart was shown covering the maximum and minimum percentage of B. T. U. *contained in the initial steam supply* to the engine *which are also present in the exhaust.* According to this chart an engine using 40 lbs. of steam per 1 H. P. would have about 94.4% to 93.8% (of the original B. T. U.) contained in the exhaust steam and ready for use in the heating system. Mr. Meyers goes on to say "It is, perhaps, hardly necessary to state that the results in the use of exhaust steam in actual practice closely agree with these determinations of heating value. Any engineer who has had the opportunity to make observations with actual measurements, has found that exhaust steam from a simple engine is worth, for heating purposes, nearly as much as live steam. I have myself been fortunate in having had opportunities for this

kind of measurement. I might mention one case where several slide valve engines were used to furnish power whose exhaust steam was absorbed by the heating system in a large manufacturing concern. The exhaust steam just balanced the heating requirements at the time of year when I made my experiment. I shut down all the engines in the plant and supplied the heating system by using the live steam at reduced pressure. The fuel was carefully weighed and it was found that just as much was consumed during the test with the engines shut down as when all the engines were developing their full quota of power. . . . I have made other tests which have checked up these results closely."

Of course, the point of cut-off has much to do with the condensation attained in the cylinder, which is only another way of saying an efficient engine makes a thermally inefficient exhaust. The longer the cut-off the less the condensation, as may be seen from steam pumps which consume only about 1% of the B. T. U. supplied, leaving their exhaust *with* a thermal efficiency of 99%.

Considering the fact that many engineers advocate the use of engine exhaust steam in preference to live steam and that authentic instances are known where the installation of engines has actually *reduced* the coal bills *and perforce the pounds of steam produced* we believe our reply checks very closely with the results which would be actually attained. Of course the question as originally submitted was more or less academic and hypothetical, it being impossible to exhaust an engine into a heating system at atmospheric pressure—usually 3 to 10 lbs. of back pressure must be carried in such cases. It is a question, however, whether the full 4,000 lbs. of steam could not really be considered in view of the practically equal efficiency of exhaust steam found in actual practice.

Leon H. Prentice, president of the L. H. Prentice Co., Chicago, Ill., has the sympathy of his friends in the death of his wife which occurred July 30, at their home in Waukegan. It is thought her death was hastened by the drowning of her son, Hamill, about a year ago.

The New York School of Heating and Ventilating announces the opening of the fifth annual season for 1917-1918, on Monday and Wednesday evenings, commencing October 1, in Room 512, World Building, New York. Charles A. Fuller will direct the classes. The secretary is G. G. Schmidt, World Building, New York. The fee for each course (first year and second year) is $15.00.

LEGAL DECISIONS

"Accident" Under Workmen's Compensation Act.

Action was brought for compensation under the Nebraska Workmen's Compensation Act by a steam fitter's helper employed by a corporation engaged in the heating and plumbing business. The plaintiff's duty was to attend to and fire a steam-heating boiler, and he was compelled to use a narrow passageway when inspecting the steam gauges. Two iron beams lay on the boiler, and the ends projected over the passage. The plaintiff attempted to move them out of the way by pushing with his body, when he felt pain in his stomach, became faint and weak, and was compelled to cease work and be assisted home. On the third day afterwards he vomited blood, and subsequently had a slight paralytic stroke. It was held that his condition was the result of an accident as defined in section 3693 of the statute and that the inquiry arose out of and in the course of his employment. The section reads: "The word 'accident,' as used in this article shall, unless a different meaning is clearly indicated by the context, be construed to mean an unexpected or unforseen event, happening suddenly and violently, with or without human fault and producing at the time objective symptoms of an injury."—Manning vs. Pomerene, 162 N. W., 492.

Liability of School District Trustees for Heating System.

Suit was brought by a materialman who furnished a heating apparatus for a public school building in Poplar Bluff, Mo., against the members of the board of directors of the school district, based on the failure of the board to require the contractor to execute a bond to the district conditioned for the payment of all material used in the work as required by Mo. Rev. St. 1909, § 1247. That statute declares that it shall be the duty of all officials, or agents of the state or municipalities, in making contracts for public work, to require every contractor to execute a bond in an amount to be fixed by such officials, boards, commission, etc., which bond shall be conditioned for the payment of material used in such work and for labor performed. It appeared that contractors contracted to equip the school building with a heating

system, the contractors to provide all materials and perform all necessary work for its installation. The contractors executed a bond conditioned that, if they should comply with all the covenants in the contract and should protect the school district from every claim, demand, judgment or lien that might be had against the building to be erected and should repay to the school district all sums of money which they might pay to other persons on account of work and labor done or materials furnished, then it should be void. It was held that the bond, which did not comply with the statute in not providing for payment for materials, was not available as common-law obligation on which materialmen and subcontractors might sue, and, as the taking of the bond was a ministerial act, the trustees of the district were liable for their failure to demand a bond in accordance with the statute.—C. A. Burton Machinery Co. vs. Ruth (Mo), 194 S. W., 526.

Reasonable Return.

The Indiana Public Service Commission holds that a rate of but 1½ per cent to a light, heat and power company is confiscatory and if continued must result in a refusal of investors to put more money into the utility. The rights of the people are not affected by overcapitalization unless it reaches a point where the fixed charges are such as to break down the service. The capitalization is given but little consideration in determining the fair value of the property. **Re** Richmond Light, Heat & Power Co.

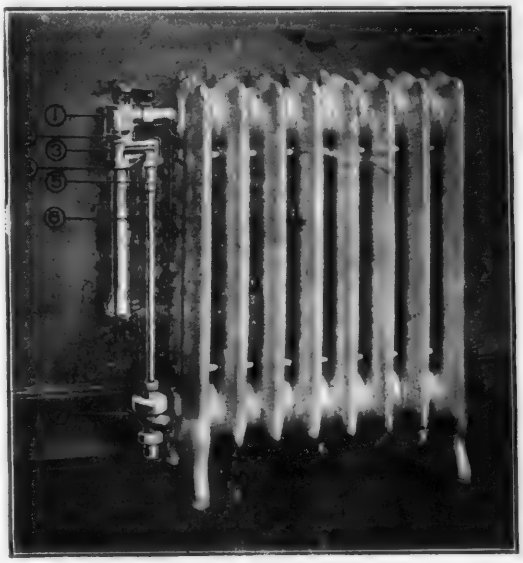
Valuation for Rate-Making.

The West Virginia Public Service Commission holds, that the rate-making value of a utility cannot be determined solely by the reproduction cost less depreciation plus appreciation, since the amount so determined is merely one of the elements which may be considered. It holds that the going value of a utility should be considered in a rate valuation; but a specific sum should not be allowed for such value, especially where no losses have been suffered in establishing the business. A utility is entitled to a sufficient income to enable it to set aside annually for depreciation, during the life of the utility, a sum which properly invested will amount to the present value of the plant. The depreciation of a natural gas company is more rapid than that of other utilities. **Re** Clarksburg Light & Heat Co.

NEW DEVICES

The Broomell Thermatic Modulation Valve.

The usual plan of vacuum heating is to equip the return end of the radiator with



BROOMELL THERMATIC MODULATION VALVE.

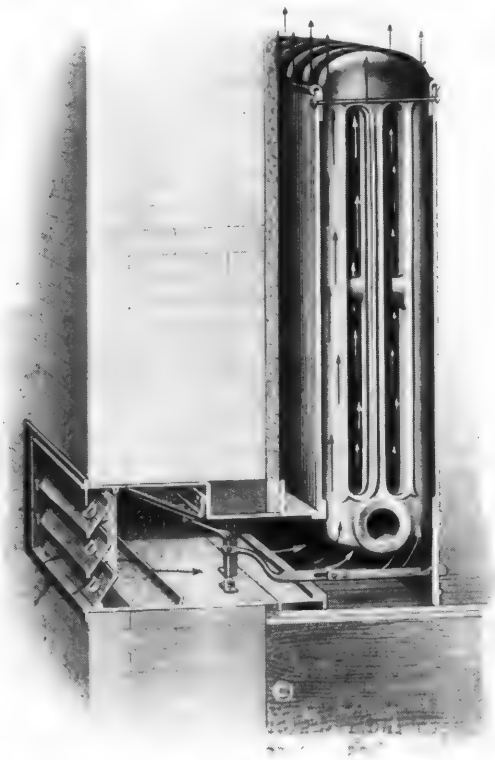
a thermostatic trap designed to close when steam begins to pass out at the return. In a new type of valve just brought out by the Vapor Heating Co., York, Pa., the thermostatic action takes place at the inlet to the radiator. This, in a word, is the distinguishing feature of this new device which, it is stated, has already received wide and enthusiastic endorsement. The valve is designed to operate with or without a vacuum pump and at any steam pressure from 5 oz. to 5 lbs. No trap, check valve, or fixture of any kind is on the return which is always open full size. The thermostatic disc does not come in direct contact with the steam or condensation, but absorbs heat from the disc holder.

With the Broomell Thermatic system a vacuum is created in the radiator back to the inlet valve and this acts to keep the radiators from being air-bound. If the inlet valve leak or should the modulation valve be open slightly, it is possible to maintain a vacuum in the radiator, the steam to the radiator being condensed before it reaches the return outlet.

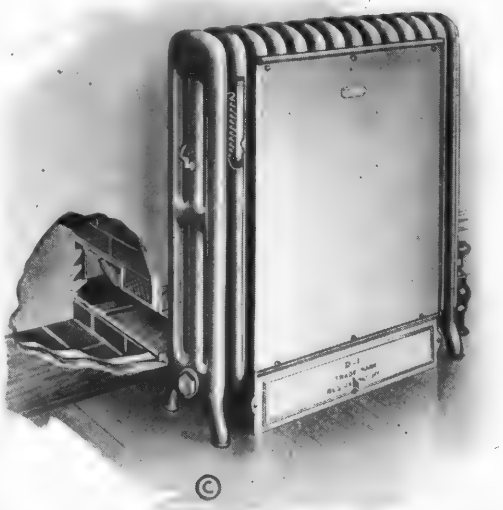
Trade Literature.

WESTINGHOUSE ELECTRICAL EQUIPMENT FOR VENTILATING SERVICE, for furnishing "pure air by wire," is the title of a new publication received from the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. After calling attention to the growth of building ventilation, and the company's development of electrical apparatus for use in this connection, the bulletin takes up the types of motors and their application, covering the important features of direct-current motors and direct-current controllers, and different types of alternating-current motors, including the squirrel-cage motor and the wound-rotor motor. Mention is also made of Westinghouse-Ventura and Sirocco blowers, this being supplemented by data on the "power required to drive fans and blowers," with formula. The illustrations include a large number of buildings which have been equipped with Westinghouse ventilating apparatus. Size 8½ × 11 in. (standard). Pp. 20.

D-I HEATING AND VENTILATING SPECIALTIES, for schools, hospitals and other public buildings, manufactured by C. C. Shipp & Co., Indianapolis, Ind., are brought to the attention of the trade in an elaborate catalogue. These specialties comprise a ventilating wall box which is, in reality, an



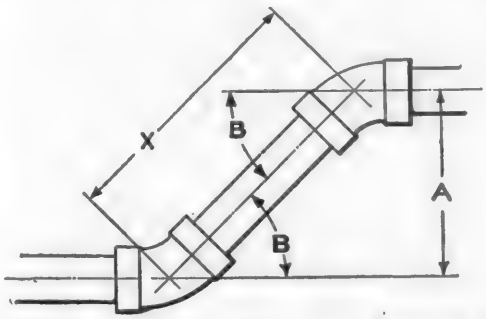
D-I CAST-IRON VENTILATING WALL BOX, EXTENSION SLEEVE AND ADJUSTABLE CONTROLLING FRESH AIR DAMPER.



RADIATOR EQUIPPED WITH D-I AUTOMATIC SUPPLY AND AIR RELEASE AND WITH HUMIDIFYING SECTION.

opening in the wall of the building at the base of the radiator; an adjustable box base connection; an adjustable ventilating box base; adjustable air diffusers; an adjustable controlling fresh air damper indicator; and a removable air moistener, with automatic supply valve. All of the specialties are intended to provide for ventilation without drafts and without the use of fans or blowers. When assembled they form a metal channel for the passage of fresh air, leading from an opening in the wall of the building at the base of the radiator, in through the wall, then upward at a right angle through the sections of the radiator. The removable air moistener used with these specialties is hung on the upper half of the radiator between the radiator and the front adjustable air diffuser, the inside wall of the moistener being corrugated. The moistener is supplied with water of condensation by means of an automatic supply and siphon check valve. By this means the humidity is controlled automatically. This section and valve are one of the company's inventions, but are being manufactured and assembled by the American Radiator Company in its 38-in. three-column Peerless steam radiators, to be used in connection with the D-I ventilating specialties. A special section is devoted to "Method of Calculation for D-I Specialties." Numerous school and other buildings are shown equipped with this system, the catalogue concluding with capacities and price lists and the company's guarantee. Several pages are given up to the opinions of experts bearing out the claims made by the company in support of the method of heating and ventilating buildings. Size 8 × 11 in. Pp. 62.

VENTILATION, HEATING, DRYING is the title of a unique circular issued by W. L. Fleisher, Inc., New York, "contracting industrial engineers." This company has specialized in systems for steam, moisture and gas absorption in textile dye houses, and photographs are presented of several typical installations. The company's method of arranging hot water supply systems in such buildings is also taken up. The remainder of the circular discusses drying processes for factories and hot blast mill heating systems. The company states that it has a completely organized and



X (Center to Center) = A (Offset) Multiplied by Constant.

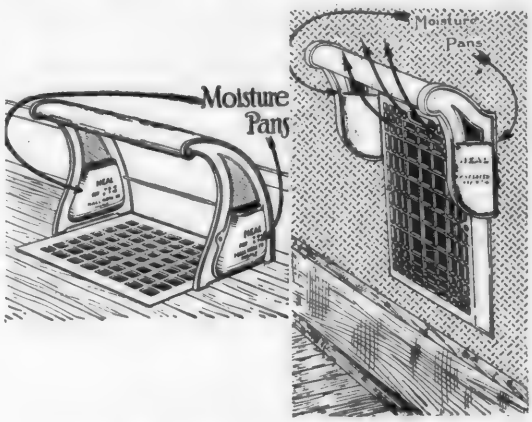
equipped department for the designing and installation of power plants, piping systems and automatic sprinkler systems.

VALVE WORLD for July, 1917, the monthly periodical of Crane Co., Chicago, contains, among other things, an interesting formula for offset connections covering the various offsets used in general practice. In the accompanyng diagram × (center to center) = A (offset) multiplied by constant. The constants are as follows:

B-ANGLE	CONSTANT
60 Degrees	1.15
45 Degrees	1.41
30 Degrees	2.00
22½ Degrees	2.61
11¼ Degrees	5.12
5⅝ Degrees	10.20

ON THE TRAIL OF BYERS PIPE, being an illustrated record of the service given by Byers pipe in heating, plumbing and power systems, installed from 25 to 40 years ago, is the title of an interesting booklet published by the A. M. Byers Co., Pittsburgh, Pa. The company has been fortunate enough to trace, through old files and old contractors, a number of old-time installations of Byers Pipe in different cities. In each case the facts are given about the condition of the pipe lines after long service, the whole constituting an impressive tribute to the durability of Byers genuine wrought-iron pipe. Pictures of the buildings accompany the notes and give a reminiscent touch to the booklet, at the same time impressing the reader with the Byers company's long and successful career. Size 4 × 6¼ in. Pp. 40.

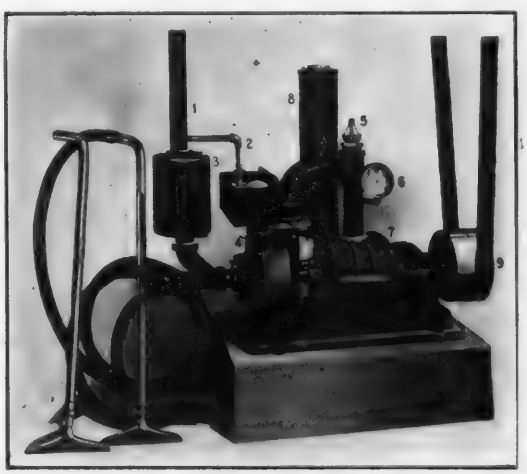
NEAL'S PATENT REGISTER SHIELDS are an interesting product of the Hall Hardware Co., Indiaiapolis, Ind., featured in recent circular



TYPES OF NEAL REGISTER SHIELDS.

matter issued by this company. It will be noted that the shields are equipped with water pans for supplying humidity to the air. They are also made with pockets for catching the dust coming through in the air supply. They are made for both floor and wall installation, in various sizes. Floor shields with ½-gal. moisture pan capacity are also furnished.

CONNERSVILLE VACUUM CLEANERS, centrifugal separating type, for laundries and carpet-cleaning establishments, are the subject of a recent circular issued by the United Vacuum Appliance Co., Connersville, Ind. The vac-



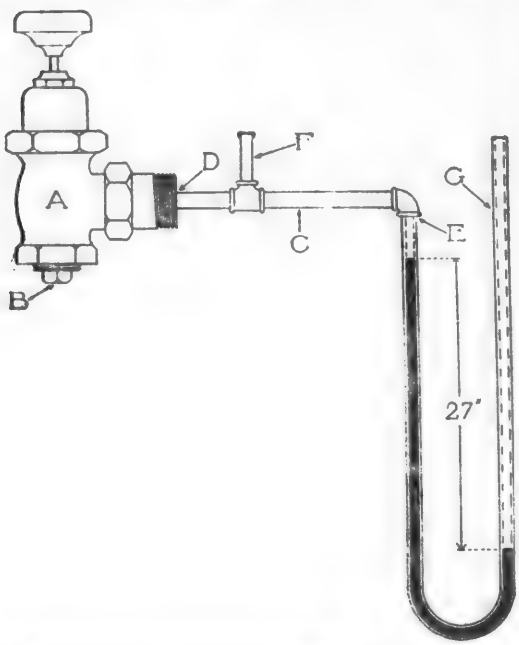
LATEST TYPE OF CONNERSVILLE VACUUM CLEANER, CENTRIFUGAL, SEPARATING TYPE.

uum producer for these machines is the well-known Connersville double-impeller rotary blower, while the centrifugal separator is in the form of a rotor which turns within the separator case, separating the dirt and water from the air and discharging them into the sewer under no pressure. Because of this feature there are no tanks, bags, screens or buckets. The accompanying illustration, taken from the circular, shows a typical installation in the carpet-cleaning department of the Brooks Laundry Co., Oak Park, Ill.

LOOK INSIDE FOR DETAILS is the title of an ingeniously-designed circular devoted to the Carrier Air Washer, manufactured by the Carrier Air Conditioning Co., Buffalo, N. Y. The circular is so printed and folded as to show both the exterior and interior of the air washer, attention being called to different details of construction in a way that makes things very clear.

Vacuum Held Thirty Days by Radiator Valve.

A test of a Sylphon packless radiator valve which held 27 in. of vacuum for thirty days is reported by W. M. Fulton, president of the Fulton Company in a recent issue of the Ideal Heating Journal. The valve A (see illustration) was tightly plugged at the bottom B, and small pipe C was soldered to tail-piece at D and hermetically connected to mercury U-tube G, at E. A vacuum pump was connected to the pipe F and a vacuum of about 27 in. was formed, and then the pipe F was hermetically sealed. The valve was allowed to remain connected in this way for thirty days, during which time the writer raised the disk to the full height above the seat, and pressed it down again tightly against the seat, one hundred times a day.



METHOD OF TESTING SYPHON PACKLESS RADIATOR VALVE.

At the end of thirty days the height of the mercury column showed no change whatever, and there was no change in its height during the test, excepting a slight variation due to the change in barometric pressure of the atmosphere, as shown by the local weather bureau records.

Compact Form of Motor Drive for Blowers.

The accompanying illustration shows a compact and economical form of motor drive for blowers as installed in the Postal Life Building, 511 Fifth Avenue, New York. The

MOTOR DRIVE FOR BLOWERS INSTALLED IN POSTAL LIFE BUILDING, NEW YORK.

equipment consists of Sturtevant supply and exhaust fans direct-connected to a Westinghouse 20 h.p., 230 r.p.m. motor for ventilating the first two floors of this building. The speed of the motors may be reduced to 155 r.p.m. by the controller.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until September 21, 1917, for the construction of the U. S. Post Office at Kendallville, Ind.

VELOCITY IN VENT FLUES DUE TO HEATING AIR.

When air in a flue is heated above that of the outside air, into which the flue is opened, the flue air is expanded to a relatively greater volume and therefore has a relatively less weight than the outside air. This state results in a tendency to equalize the unbalanced condition, giving motive power to produce a draft in the flue largely similar to the action of a common chimney.

Ventilation operated by heating the air in vertical flues is termed a "gravity" system but cannot be recommended on account of troubles due to non-positive results, back-drafts, etc. Owing to cheapness such flues are often used and when so employed should be figured conservatively to allow for friction and other retardents. The following table is thought to be as reliable as any table can be when made to fit a set of conditions which are not positive.

VENT FLUE VELOCITIES IN FEET PER MINUTE.

Height of flue in feet	Temperature in flue above outside temperature, in degrees, Fahr.						
	5°	10°	15°	20°	30°	50°	100°
	Velocity in Flue in Feet Per Minute.						
5	55	76	94	109	134	167	242
10	77	108	133	153	188	242	342
15	94	133	162	188	230	297	419
20	108	153	188	217	265	342	484
25	121	171	210	242	297	383	541
30	133	188	230	265	325	419	593
35	143	203	248	286	351	453	640
40	153	217	265	306	375	484	684
45	162	230	282	325	398	514	724
50	171	242	297	342	419	541	765
60	188	264	325	373	461	594	835
100	238	342	420	485	594	768	1080

AREA IN SQUARE FEET OF ANY ROUND, SQUARE OR RECTANGULAR PIPE FROM 8 INCHES TO 8 FEET

Side or Diameter Inches	Round Pipe	Square or Oblong Pipe	SIZE OF PIPE - - INCHES																													SIZE OF PIPES - - INCHES
			96	94	92	90	88	86	84	82	80	78	76	74	72	70	68	66	64	62	60	58	56	54	52							
8	0.35	0.45	64.00	62.67	61.33	60.00	58.67	57.33	56.00	54.67	53.33	52.00	50.67	49.33	48.00	46.67	45.33	44.00	42.67	41.33	40.00	38.67	37.33	36.00	34.67							96
9	0.44	0.50	0.56		61.36	60.05	58.75	57.43	56.14	54.83	53.53	52.22	50.92	49.61	48.30	47.00	45.70	44.39	43.08	41.78	40.47	39.17	37.86	36.56	35.25	33.95						94
10	0.55	0.56	0.62	0.69		58.78	57.50	56.23	54.95	53.67	52.39	51.11	49.83	48.56	47.28	46.00	44.72	43.44	42.16	40.89	39.61	38.33	37.05	35.78	34.50	33.23						92
11	0.66	0.61	0.69	0.76	0.84			56.25	55.00	53.75	52.50	51.25	50.00	48.75	47.50	46.25	45.00	43.75	42.50	41.25	40.00	38.75	37.50	36.25	35.00	33.75	32.50					90
12	0.79	0.67	0.75	0.83	0.92	1.00			53.77	52.55	51.33	50.11	48.89	47.67	46.44	45.22	44.00	42.78	41.55	40.33	39.11	37.89	36.67	35.44	34.22	33.00	31.78					88
13	0.92	0.72	0.81	0.90	0.99	1.08	1.17			51.36	50.17	48.97	47.78	46.58	45.39	44.19	43.00	41.81	40.61	39.42	38.22	37.03	35.83	34.63	33.44	32.25	31.05					86
14	1.07	0.78	0.87	0.97	1.06	1.17	1.26	1.36			49.00	47.83	46.67	45.50	44.33	43.16	42.00	40.84	39.67	38.50	37.33	36.17	35.00	33.83	32.67	31.50	30.33					84
15	1.23	0.83	0.94	1.04	1.14	1.25	1.35	1.46	1.56			46.69	45.55	44.41	43.28	42.14	41.00	39.86	38.72	37.58	36.44	35.31	34.17	33.03	31.89	30.75	29.61					82
16	1.39	0.89	1.00	1.11	1.22	1.33	1.44	1.55	1.67	1.78			44.44	43.33	42.22	41.11	40.00	38.89	37.78	36.67	35.56	34.44	33.33	32.22	31.11	30.00	28.89					80
17	1.57	0.94	1.06	1.18	1.29	1.42	1.53	1.65	1.77	1.89	2.01			42.25	41.17	40.08	39.00	37.92	36.83	35.75	34.67	33.58	32.50	31.42	30.33	29.25	28.17					78
18	1.76	1.00	1.12	1.25	1.37	1.50	1.62	1.75	1.87	2.00	2.12	2.25			40.11	39.05	38.00	36.94	35.89	34.83	33.78	32.72	31.67	30.61	29.56	28.50	27.44					76
19	1.97	1.06	1.19	1.32	1.45	1.58	1.71	1.84	1.98	2.11	2.24	2.37	2.50			38.03	37.00	35.97	34.94	33.92	32.89	31.86	30.83	29.80	28.78	27.75	26.72					74
20	2.18	1.11	1.25	1.38	1.52	1.67	1.80	1.94	2.08	2.22	2.36	2.50	2.63	2.78			36.00	35.00	34.00	33.00	32.00	31.00	30.00	29.00	28.00	27.00	26.00					72
22	2.64	1.22	1.38	1.52	1.68	1.83	1.98	2.13	2.29	2.44	2.60	2.75	2.90	3.05	3.36			34.03	33.06	32.08	31.11	30.14	29.17	28.19	27.22	26.25	25.28					70
24	3.14	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50	2.67	2.83	3.00	3.17	3.33	3.67	4.00			32.11	31.16	30.22	29.28	28.33	27.39	26.44	25.50	24.56					68
26	3.69	1.44	1.62	1.80	1.98	2.17	2.34	2.53	2.71	2.89	3.07	3.25	3.43	3.62	3.97	4.33	4.70			30.25	29.33	28.42	27.50	26.58	25.67	24.75	23.83					66
28	4.27	1.56	1.75	1.94	2.14	2.33	2.52	2.72	2.92	3.11	3.30	3.50	3.69	3.89	4.28	4.67	5.06	5.45			28.44	27.56	26.67	25.78	24.89	24.00	23.11					64
30	4.90	1.67	1.88	2.08	2.29	2.50	2.71	2.92	3.12	3.33	3.54	3.75	3.96	4.17	4.58	5.00	5.41	5.83	6.25			26.69	25.83	24.97	24.11	23.25	22.39					62
32	5.58	1.78	2.00	2.22	2.44	2.67	2.89	3.11	3.33	3.56	3.78	4.00	4.22	4.44	4.89	5.33	5.78	6.22	6.67	7.11			25.00	24.17	23.33	22.50	21.67					60
34	6.30	1.89	2.12	2.36	2.59	2.83	3.07	3.30	3.54	3.78	4.02	4.25	4.48	4.72	5.19	5.67	6.15	6.61	7.09	7.56	8.03			23.36	22.56	21.75	20.94					58
36	7.06	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00			21.78	21.00	20.23					56
38	7.87	2.11	2.38	2.63	2.90	3.17	3.43	3.69	3.96	4.22	4.50	4.75	5.01	5.28	5.80	6.33	6.86	7.39	7.91	8.44	8.97	9.50	10.03			20.25	19.50					54
40	8.73	2.22	2.50	2.77	3.05	3.33	3.61	3.89	4.17	4.44	4.73	5.00	5.28	5.56	6.11	6.67	7.23	7.78	8.33	8.89	9.44	10.00	10.56	11.11		18.78						52
42	9.62	2.33	2.62	2.91	3.21	3.50	3.79	4.08	4.38	4.67	4.96	5.25	5.54	5.83	6.42	7.00	7.58	8.17	8.75	9.33	9.91	10.50	11.09	11.67	12.25							
44	10.56	2.44	2.75	3.05	3.36	3.67	3.97	4.28	4.58	4.89	5.19	5.50	5.81	6.11	6.71	7.33	7.94	8.56	9.16	9.78	10.38	11.00	11.61	12.22	12.83	13.44						
46	11.54	2.56	2.88	3.19	3.51	3.83	4.15	4.47	4.79	5.11	5.44	5.75	6.07	6.38	7.01	7.67	8.31	8.95	9.58	10.22	10.85	11.50	12.14	12.78	13.42	14.06	14.69					
48	12.56	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00	5.33	5.67	6.00	6.33	6.67	7.33	8.00	8.67	9.33	10.00	10.67	11.33	12.00	12.67	13.33	14.00	14.67	15.33	16.00				
50	13.63	2.78	3.12	3.47	3.82	4.17	4.51	4.86	5.21	5.56	5.92	6.25	6.60	6.95	7.63	8.33	9.03	9.72	10.42	11.11	11.80	12.50	13.20	13.89	14.58	15.28	15.97	16.67	17.36			

AREA IN SQUARE FEET OF ANY ROUND, SQUARE OR RECTANGULAR PIPE FROM 8 INCHES TO 8 FEET

Side of pipe inches	8	9	10	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50

(Note—For last portion of Table see Sheet No. 10-K)

AREA IN SQUARE FEET OF ANY ROUND, SQUARE OR RECTANGULAR PIPE FROM 8 INCHES TO 8 FEET.

Side or Diameter Inches	Round Pipe	AREA OF SQUARE OR RECTANGULAR PIPES IN SQUARE FEET																												
52	14.75	2.89	3.25	3.61	3.97	4.33	4.69	5.06	5.41	5.78	6.15	6.50	6.86	7.23	7.93	8.67	9.39	10.11	10.83	11.56	12.28	13.00	13.73	14.44	15.17	15.88	16.61	17.33	18.06	
54	15.90	3.00	3.30	3.75	4.13	4.50	4.88	5.25	5.62	6.00	6.38	6.75	7.13	7.50	8.25	9.00	9.75	10.50	11.25	12.00	12.75	13.50	14.25	15.00	15.75	16.50	17.25	18.00	18.75	
56	17.10	3.11	3.58	3.88	4.28	4.67	5.05	5.44	5.83	6.22	6.61	7.00	7.39	7.77	8.56	9.33	10.11	10.89	11.67	12.44	13.22	14.00	14.78	15.55	16.33	17.12	17.88	18.67	19.44	
58	18.34	3.22	3.62	4.02	4.43	4.83	5.23	5.64	6.04	6.44	6.85	7.25	7.65	8.06	8.86	9.67	10.47	11.28	12.08	12.89	13.69	14.50	15.31	16.11	16.92	17.72	18.53	19.33	20.14	
60	19.63	3.33	3.75	4.16	4.59	5.00	5.41	5.83	6.25	6.67	7.10	7.50	7.92	8.33	9.17	10.00	10.83	11.67	12.50	13.33	14.17	15.00	15.85	16.67	17.50	18.33	19.16	20.00	20.84	
62	20.96	3.44	3.88	4.30	4.74	5.17	5.59	6.02	6.46	6.89	7.32	7.75	8.18	8.61	9.47	10.33	11.21	12.06	12.92	13.78	14.64	15.50	16.37	17.22	18.08	18.95	19.80	20.67	21.53	
64	22.34	3.56	4.00	4.44	4.88	5.33	5.77	6.22	6.67	7.11	7.56	8.00	8.42	8.89	9.77	10.67	11.56	12.44	13.33	14.22	15.11	16.00	16.90	17.77	18.67	19.56	20.44	21.33	22.22	
66	23.76	3.67	4.12	4.58	5.05	5.50	5.95	6.41	6.87	7.33	7.80	8.25	8.71	9.17	10.08	11.00	11.91	12.83	13.75	14.67	15.58	16.50	17.43	18.33	19.25	20.17	21.08	22.00	22.92	
68	25.21	3.78	4.25	4.72	5.19	5.67	6.13	6.61	7.08	7.56	8.04	8.50	8.98	9.46	10.39	11.33	12.28	13.22	14.17	15.11	16.05	17.00	17.95	18.88	19.83	20.78	21.72	22.67	23.61	
70	26.72	3.89	4.38	4.86	5.34	5.83	6.31	6.80	7.29	7.78	8.26	8.75	9.24	9.73	10.67	11.67	12.64	13.61	14.58	15.56	16.53	17.50	18.48	19.44	20.42	21.38	22.36	23.33	24.30	
72	28.27	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	
74	29.86	4.11	4.62	5.14	5.65	6.17	6.68	7.19	7.71	8.22	8.76	9.25	9.76	10.28	11.30	12.33	13.36	14.39	15.42	16.44	17.47	18.50	19.53	20.56	21.58	22.61	23.63	24.67	25.69	
76	31.50	4.22	4.75	5.27	5.80	6.33	6.86	7.39	7.91	8.44	8.97	9.50	10.03	10.56	11.60	12.67	13.72	14.78	15.83	16.89	17.94	19.00	20.06	21.11	22.17	23.22	24.27	25.33	26.39	
78	33.18	4.33	4.88	5.41	5.95	6.50	7.04	7.58	8.12	8.67	9.21	9.75	10.29	10.83	11.91	13.00	14.08	15.17	16.25	17.33	18.41	19.50	20.59	21.67	22.75	23.83	24.91	26.00	27.08	
80	34.90	4.44	5.00	5.56	6.11	6.67	7.22	7.78	8.33	8.89	9.44	10.00	10.56	11.11	12.22	13.33	14.44	15.56	16.67	17.78	18.89	20.00	21.11	22.22	23.33	24.44	25.56	26.67	27.78	
82	36.67	4.56	5.12	5.69	6.26	6.83	7.40	7.97	8.54	9.11	9.68	10.25	10.82	11.39	12.53	13.67	14.80	15.94	17.08	18.22	19.36	20.50	21.64	22.77	23.92	25.06	26.19	27.33	28.47	
84	38.48	4.67	5.25	5.83	6.42	7.00	7.58	8.17	8.75	9.33	9.92	10.50	11.08	11.67	12.83	14.00	15.17	16.33	17.50	18.67	19.83	21.00	22.17	23.33	24.50	25.67	26.83	28.00	29.17	
86	40.33	4.78	5.38	5.97	6.57	7.17	7.76	8.36	8.96	9.56	10.15	10.75	11.34	11.94	13.14	14.33	15.53	16.72	17.92	19.11	20.30	21.50	22.70	23.89	25.09	26.29	27.46	28.67	29.86	
88	42.24	4.89	5.50	6.11	6.72	7.33	7.94	8.56	9.16	9.78	10.39	11.00	11.61	12.22	13.44	14.67	15.90	17.11	18.33	19.56	20.78	22.00	23.22	24.44	25.67	26.90	28.10	29.33	30.56	
90	44.18	5.00	5.62	6.25	6.88	7.50	8.12	8.75	9.37	10.00	10.62	11.25	11.88	12.50	13.75	15.00	16.25	17.50	18.75	20.00	21.25	22.50	23.75	25.00	26.25	27.50	28.75	30.00	31.25	
92	46.16	5.11	5.75	6.38	7.02	7.67	8.30	8.94	9.58	10.22	10.86	11.50	12.14	12.80	14.06	15.33	16.61	17.89	19.17	20.44	21.72	23.00	24.28	25.56	26.83	28.11	29.37	30.67	31.94	
94	48.19	5.22	5.88	6.52	7.18	7.83	8.48	9.14	9.79	10.44	11.10	11.75	12.40	13.06	14.36	15.67	16.97	18.28	19.58	20.89	22.19	23.50	24.81	26.11	27.42	28.72	30.00	31.33	32.64	
96	50.26	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00	10.67	11.33	12.00	12.67	13.33	14.67	16.00	17.33	18.67	20.00	21.33	22.67	24.00	25.33	26.67	28.00	29.33	30.67	32.00	33.33	

Side of Pipe Inches	8	9	10	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50

(Note—For first portion of table see Sheet No. 10-J.)

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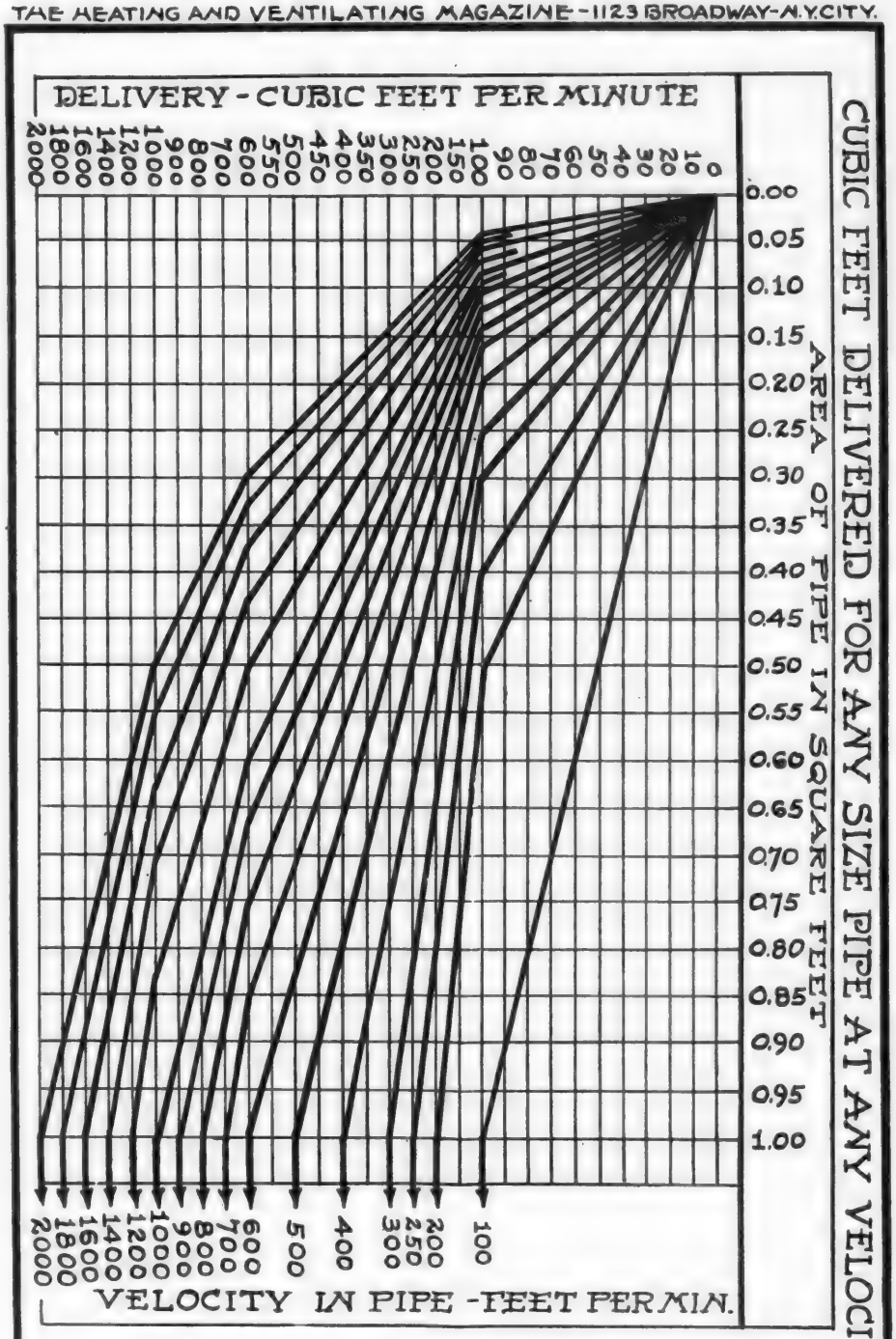

NOTE—For areas of pipe larger than those given in curves move the decimal point of the given area one or two places to left so as to reduce the area to within the limits between zero and 1.00; read the result from the curve and add the same number of ciphers to the result as the number of places the decimal point was moved.

PIPE CAPACITIES AT VARIOUS VELOCITIES | NO. 10-J

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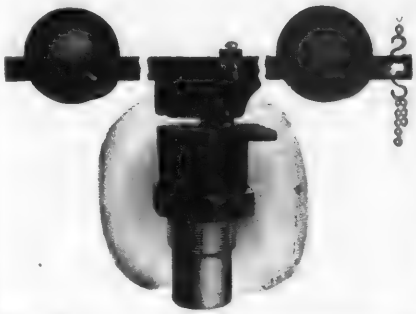

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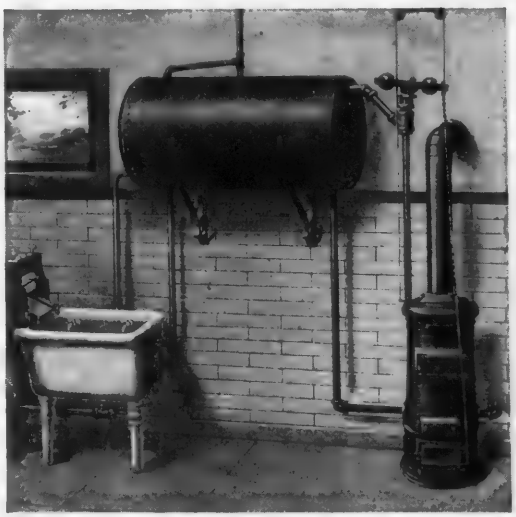

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TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes

Springfield, Mass.—William P. Brown has resigned as expert for the City Property Committee on heating and ventilating. The fact that Mr. Brown is in the employ of a Springfield heating and ventilating firm had given rise to much criticism of his dual activities although it was pointed out that no direct cause for complaint had arisen.

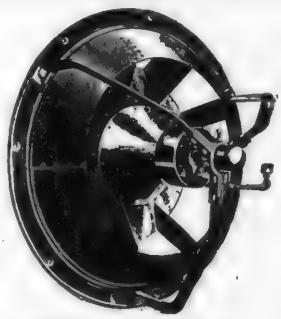
New York.—"No Heat" clauses will confront tenants when they come to sign October leases with New York landlords. In addition to relieving landlords of the responsibility of furnishing heat, the leases contain other restrictions upon tenants more stringent than ever before.

Cedar Rapids, Ia.—Manchester has voted to raise $7,000 by tax to install a new heating plant in the Central School.

Toledo, O.—Claiming that he contracted tuberculosis due to poor ventilation and unsanitary conditions while employed in the box factory of George Wilson & Sons, George Burdette has sued that company for $20,000.

Japanese Association of Heating, Ventilating and Refrigerating Engineers is the proposed title for a new organization recently formed in Tokio, Japan. Among the promoters of the new association are Doctor Mano, president of the Imperial University of Kyushu, Professors Sakata, and Kamo, Architects Tatsuno, Nagano and Sone, and Engineer Shozo, who is one of Japan's most prominent heating and ventilating engineers and contractors. Japanese heating and ventilating practice is well advanced as is evidenced by the fact that a number of American journals on heating and power work, including THE HEATING AND VENTILATING MAGAZINE, have a considerable Japanese circulation.

Building Operations for July show a shrinkage of 49%, as compared with the corresponding operations for July, 1916.



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The total for 116 cities, as compiled by the *American Contractor,* Chicago, comes to $58,726,904, as compared with $115,313,797 for July, 1916. A large part of this loss, however, is offset by the fact that the figures for Manhattan Borough, New York, in 1916, amounting to over $49,000,000, were occasioned by the rush to file plans before the new zoning law went into effect. The decrease was 96%, as this July's total was $1,894,095. Under normal conditions, therefore, the decrease for the entire country would be about 17%. Cities showing increased building activity were: Baltimore 44%, Buffalo 30%, Cleveland 11%, Duluth 83%, Fort Wayne 133%, Jacksonville 231%, Los Angeles 17%, New Orleans 115%, New Haven 67%, Philadelphia 67% (including permit for $2,535,000 public library building), Pittsburgh 42%, Wichita 233%, St. Paul 30% and Youngstown 30%. Important cities reporting losses were Boston 12%, Bridgeport 28%, Chicago 48%, Cincinnati 10%, Detroit 9%, Indianapolis 37%, Kansas City 6%, Milwaukee 53%, Minneapolis 49%, New York 90%, Rochester 47%, San Francisco 39%, St. Louis 12%, Toledo 36% and Washington 64%.

W. G. Cornell Co., heating and plumbing engineers and contractors, has opened an office in Cleveland, O., in the Leader-News Building, under the management of D. M. Quay.

Butte, Mont.—The building committee of the Butte Y. M. C. A. has voted to go ahead at once with the general building contract and the heating and plumbing contracts for the new $200,000 Y. M. C. A. building in that city.

Bellingham, Wash.—Steps have been taken by the trustees of the State Normal School, in Bellingham, to construct a new heating plant at that institution, $20,000 having been appropriated for that purpose by the last legislature. The plans will be drawn by Engineer Weber, of Seattle.

Flint, Mich.—According to a report of Smoke Inspector E. W. Hills, of Flint, the reason for the excessive amount of smoke which comes from the various large boiler furnaces throughout the city, is due to poor ventilation in the boiler rooms. "A boiler room, when in the basement," is Mr. Hills' contention, "should be well ventilated so that it will have good air for combustion. If this is carried out we will have 50% less smoke than we have now. I find that boiler rooms in the business parts of Flint have poor ventilation. They are in dark places where the air is poor. If this could be corrected there would also be a saving in coal." In 200 observations in the city Mr. Hills found that one-half of

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the places inspected are violators of the city smoke ordinance.

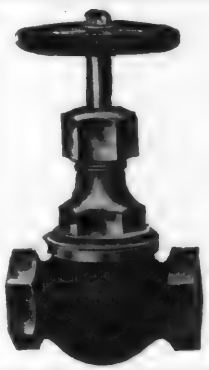
New Haven, Conn.—The contract for the big central heating plant at Yale University on York Street has been given to the C. A. Dodge Co., of Boston. The power plants will occupy a brick and steel building, one story high. The contracts for the boilers and steel work have already been given out. The cost of the plant will be from $150,000 to $200,000. Work is well along on the construction of the pipe tunnels for the system, this contract being handled by the Sperry Engineering Company, at a cost of $85,000.

New Haven, Conn.—A permit has been issued for the proposed central heating plant on Huntington Street to supply the Connecticut Agricultural Experiment Station. The plant will cost $28,000. John N. Leonard & Company are the general contractors and John D. Kelly & Company have the heating and plumbing contracts.

Central Station Heating Notes.

Detroit, Mich.—The Central Heating Company, a subsidiary of the Detroit Edison Company, is building a new heating plant at Congress Street and Cass Avenue to cost $1,000,000. The building will be a third unit in the company's downtown heating facilities and will furnish steam for practically all of the large office buildings in the district around the city hall. It is intended to build only half of the structure now and operate it until such time as demands make the additional half necessary. The part now building will be 58 × 120 ft. and 120 ft. high. It will have two 1,200 h.p. boilers.

New Ulm, Minn.—The Healy Plumbing & Heating Company, of St. Paul, was awarded the contract for making the extensions of the municipal heating system on Minnesota Street, New Ulm, for $14,982. This extension will comprise all the space on the west side of Minnesota Street between Center and First South Streets and also between Second North and Third North Streets on the same side of the street. Another extension will be on the east side of the street from Second North to and including the Grand Hotel. A number of the buildings within the extension areas will not install municipal heat but arrangements have been made for the placing of the heating mains through the basements or under the buildings. The Healy company was the contractor on the former heating contract. Other bidders for the extension were: M. J. O'Neil, St. Paul, $16,456; Collins-Synan Co., St. Paul, $15,787; and W. J. Bain, Milwaukee and J. E. G. Robb, St. Paul (joint bidders) $16,992. The plans were prepared by Charles Foster, of the Charles L. Pillsbury Engineering Co., Minneapolis. The work of installation is in charge of A. J. Mueller, superintendent of the municipal plant.



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Keewatin, Minn.—Contracts for the extension of the village-owned heating system were awarded as follows: Morgan, Gerrish & Co., of Minneapolis, conduit and insulations; Crane, Ordway & Co. of Duluth, pipe and fittings; C. A. Dunham company of Minneapolis and the Virginia Heating & Plumbing company, each to furnish some smaller lists of the material. The total estimated cost of the extension of the heating system is placed at $18,000. The council also raised the rate to the consumers of municipal heat from 18 cents to 34 cents per 100 square feet of radiation.

Palmyra, Ill.—The Palmyra Light, Heat & Power Co., has been organized with a capital stock of $10,000, to generate and supply light and power by electricity or steam. The incorporators are Lewis King, Clarence W. King and Nellie G. King, all of Palmyra.

Goshen, Ind.—Superintendent Harding of the Goshen water works and light plant, has submitted a proposition to the city council for the establishment of a central heating station to utilize the exhaust steam now being wasted at the municipal plant. It is estimated that an annual revenue of $8,683 could be derived from the sale of this exhaust steam, a sale for $4,769 of which is already in prospect. Mr. Harding, in drawing up the proposition, has had the co-operation of H. A. Woodworth, of the Chicago office of the American District Steam Company. It is proposed to heat all the business houses and residences between the water works and the high school and between Third and Sixth Streets. The cost of the proposed system would be $16,797. At the present time the total exhaust steam available from the water plant is 4,440 lbs. per hour which, it is estimated, will easily take care of the territory included in the initial plans. This does not include the electric equipment which, it is estimated, will supply in time of need a minimum of 1,500 lbs. of exhaust steam per hour and a maximum of 3,500 lbs. Mr. Harding states that different parties who would connect with the line will advance sufficient money to pay the entire cost of the system, provided that this can be done legally. He proposes that the council issue 4½% warrants in the sum of the total cost of the line and distribute these warrants among those who will use heat in amounts equal to approxi-

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mately what will be their total heating bill during the next four years. These warrants can then be liquidated as the heat is used by the consumer. This would obviate the necessity of a bond issue which would have to be voted on by the people. The council authorized Mr. Harding to prepare a complete set of plans and specifications together with all available data on the subject.

Galesburg, Ill.—More than four blocks, or 1,500 ft. of steam pipe mains are being laid by the Galesburg Railway, Lighting & Power Company to care for the added business expected next winter. Tin-lined wood casing is being used for insulation. The mains are being laid on North Prairie Street, from East Ferris to Main and on South Prairie Street, from Main to Simmons, then on South Seminary Street from Simmons Street to the Galesburg Machine works.

Davenport, Ia.—The city council has granted permission to the People's Light Company, of Davenport, to raise its rates for steam heat. The original request of the company was for a 65% increase, but this was cut down by the finance committee of the council to 32%.

Terre Haute, Ind.—As the result of a con-

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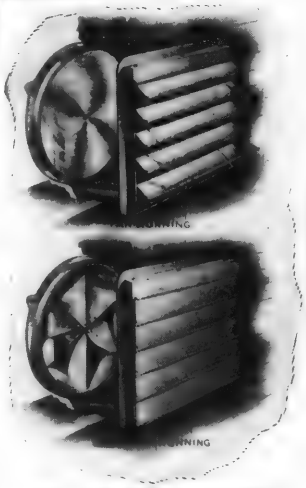

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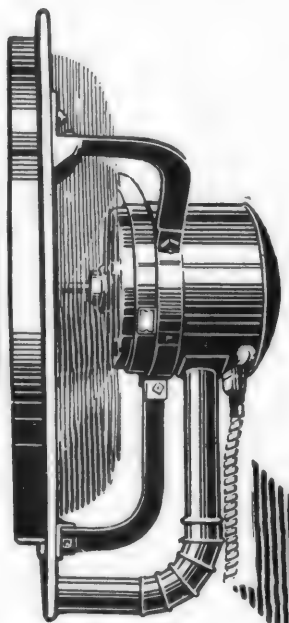

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ference between the traction company and patrons of its heating service, an arrangement was made whereby the users of heat will pay a 50% advance in rates, with the possibility of another 50% raise if necessary to enable the traction company to cover expenses. The traction company had decided to discontinue its heating plant and at the conference offered two alternatives, one being to have the merchants on the north side of the avenue take over the plant and operate it themselves or pay the proposed higher rates.

Dayton, O.—O. H. Hutchings, associate general manager of the Dayton Power & Light Company, has been elected president of the Ohio Electric Light Association. F. B. Steele, town engineer for the company, was appointed chairman of the industrial and heating section.

Indianapolis, Ind.—Some idea of the size of the Merchants Heat & Light Company's heating system is given by Superintendent C. J. Cooper, Jr., who states that if the mains of the system were laid in one line they would reach from Indianapolis to Lebanon, or 39 miles. Exclusive of service connections there are approximately nine miles of steam heating mains and more than twenty miles of hot water mains.

Indianapolis, Ind.—E. I. Lewis, chairman of the State Public Service Commission sent out a call to all hot water and steam heating plant operators in Indiana, to appear before the commission and state what rates they will operate under and what service they expect to be able to give their patrons next winter. The Interstate Public Service Company filed a petition with the Public Service Commission for an increase in heating rates in several Indiana cities. The petition affects scattered districts throughout the State.

Birmingham, Ala.—The city commission will oppose the effort of the Birmingham Railway, Light & Power Company to increase its steam heating rates. A raise of 17% is asked. Commissioner Weatherly stated that the company had a contract with the Alabama Power Company that provided for the power house being kept in a state of readiness at all times and that, in view of the present contract with the Alabama Power Company, all that the railway company made on steam heat was "velvet." Mr. Weatherly was instructed to go before the State Public Service Commission and fight the proposed rate increase. The heating company's letter stated that, on its next year's contract, it will have to pay $2.20 a ton for coal, delivered at the power house, instead of $1.50 as at present.

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Second: Pneumatic Thermostats.

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Fourth: The "SYLPHON" Metal Diaphragm Valve for heat control, the one thing needed to make heat regulating systems durable and reliable. We tested this valve three years before we offered it for use. Untested imitations and substitutes followed fast, but having been thoroughly tested and proven equal to all demands,

the "SYLPHON" is the Recognized Standard.

Fifth: Unequalled Service in all Departments.

Johnson Service Company

Milwaukee, Wis.

Offices in all Large Cities

Salt Lake City, Utah.—Under the provisions and limitations of the act which created it, the State Public Utilities Commission is considering the advisability of beginning an investigation to determine whether or not the rates charged by the Utah Power & Light company for light and heat are excessive or unreasonable. That such an investigation may be made was intimated upon the receipt of a letter from a consumer, who maintains that Salt Lake consumers of light and heat are paying more for the service than residents of other cities and that they are required to pay about 100 per cent more than is justified. The writer quotes the rates of several other cities, which he claims are lower than the prevailing rates in Salt Lake.

Spencer, Ia.—The proposition for installing a new municipal heating plant in Spencer was favorably voted up at the recent referendum. The Pittsburgh parties who are backing the plant, have arranged to start work at once and it is hoped that at least one-third of the plant will be ready by October 1, one-third by November 1 and the whole system in operation by December 1.

Tecumseh, Mich.—A proposition to install a central heating plant in Tecumseh was launched by Ralph Bidwell, owner of the Bidwell stock farms, at a meeting of the townspeople August 4. Plans were submitted whereby business places, public buildings and residences within a radius of two blocks west and two blocks east on Chicago street and one block north and one block south on Evans street, might be furnished heat from a central plant. The initial cost would be about $36,000.

Terre Haute, Ind.—The Citizens' Mutual Heating Company, through General Manager Henry Meyer, has filed a petition with the Indiana Public Service Commission for an increase in its heating rates. The petition is as follows:

"On account of the prevailing abnormal high cost of fuel, material and labor, we wish to ask you for an increase in our heating rate.

"It is most certain that the operating expenses for the coming heating season will be greatly in excess of those of last winter. The cost of material has increased from 100 to 200% and labor from 10 to 25%. A year ago we contracted coal for our season's supply at $1.25 per ton delivered at our plant, while we now signed a contract for our next winter's coal at $2.50 per ton at the mine, being equal to $2.85 at our heating plant. Comparing these figures with our

A unique valve–that won't leak steam–

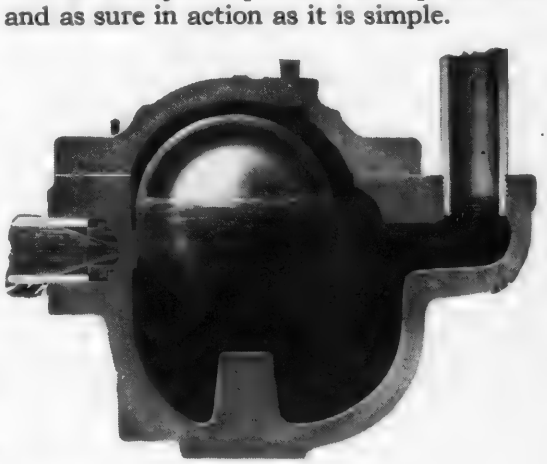
We might say—a trap without a valve—one entirely without levers, counterweights, and other small parts—even cotter pins. And yet there *is* a valve. The one moving part of the Johns-Manville trap acts as a valve and takes the place of all other complicated parts found in other traps.

"JUST A BALL"—a hollow, seamless, strong sphere—the only part that moves in the Johns-Manville trap—acts and takes the place of the valve when it rolls against the outlet seat.

So accurately are weight of ball and size of discharge balanced against buoyancy and steam pressure that this trap can neither leak steam nor air-bind.

When water first enters the trap, the ball floats to and is held against the discharge by unbalanced steam pressure, completely sealing the orifice. As the water rises, the ball rolls up and exposes the orifice, permitting discharge of water; and air is also discharged through vortices formed at the orifice. When the entering condensate decreases, the ball follows the water level down and again seals the discharge. This action is continuous as long as water flows to the trap.

It's as nearly fool-proof as a trap can be, and as sure in action as it is simple.



H. W. JOHNS-MANVILLE CO., New York City

10 Factories—Branches in 55 Large Cities

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

last year's report, and the amount of radiation on our system, this shows an increase of cost on coal alone of about 8c per square foot of radiation.

"We therefore ask your honorable board for an increase of 9c per square foot of radiation making our total rate 29c per foot of radiation, beginning Sept. 15, 1917. The extra one cent above the coal price increase will not cover our extra expense for increase in labor and material, but we are willing to do our share and stand the extra loss ourselves.

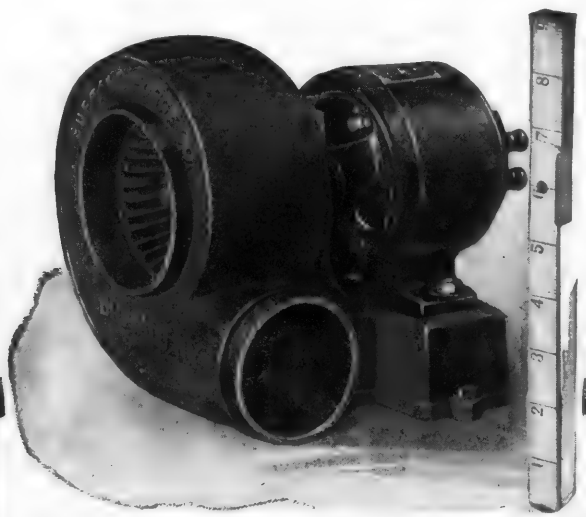
"Also, should the extra freight rate of 15c per ton of coal, asked by the railroads and now pending before your honorable board, be granted, we wish to ask for an additional increase in our heating rate of 1c per foot of radiation, making the total rate 30c per square foot of radiation.

"Should at any time in the future the operating expenses, principally the coal prices, be normal again, or less than at present, we will be only too glad to ask your commission to have our rate reduced accordingly."

Louisville, Ky.—The Louisville Gas & Electric Company has notified its steam heat customers that an increase of 33⅓% will be made for heating all floor space this winter. This means an increase from 33⅓ cents per square foot to 44.44 cents, both rates being subject to a 10% cash discount. The company has purchased the coal mine output at Render and has placed an order for 25 steel cars with the Pullman Company to insure its coal supply.

Illinois district heating companies which have filed petitions with the State Public Service Commission asking for authority to withdraw their present flat-rate schedules for steam heating service and to adopt the meter system include the Danville Street Railway & Light Company, the Bloomington & Normal Railway & Light Company, the Urbana Light, Heat & Power Company, the Clinton Gas & Electric Co., the Galesburg Railway Lighting & Power Company and the Decatur Railway & Light Company.

Waukegan, Ill.—An investigation of the city heating system is to be made by the city council to determine whether the recent rules laid down by the State Public Service Commission will be effective in Waukegan. The ruling in question is one that provides against the practice of users who purchase a limited supply of heat from the public service company and then pipe it to other parts of the building.



"Buffalo"

Baby Conoidal Fans

For ventilating offices, banquet rooms, club rooms, lavatories, staterooms, etc.,—there's practically no limit to its application.

Compact—Noiseless

—adjustable discharge—low power consumption—three sizes.

Write for Catalog 182E-36

BUFFALO FORGE COMPANY, Buffalo, N. Y.

Sirocco
TRADE MARK

Will Put Pure Washed Air Into Every Corner of Your Factory

The Dodge Bros. (Motor Cars) Office and Plant are almost exclusively equipped with Sirocco Products.

Their fine office building, here shown, is served by the Sirocco Washed Air System. Their Dining Room, Kitchen, Core Shop, Pressed Steel and Gear Shop have the healthful influence of a constant supply of fresh, properly tempered air. These departments, too, are served by Sirocco Apparatus.

Book No. 2709 illustrates many plants in which "Sirocco" Systems are used. May we send it to you?

AMERICAN BLOWER CO.

DETROIT, MICH.

Our Engineering Department will gladly assist in solving your air handling problems

Smith, Hinchman & Grylls, Detroit
Architects and Engineers

Manufacturers' Notes.

Prudential Heating Co., Akron, O., has recently increased its capital stock from $10,000 to $30,000. This company manufactures the Prudential smokeless downdraft boiler.

W. E. Lamneck Co., Columbus, O., has appointed Thomas W. Pearson as sales manager. Mr. Pearson has had 28 years' experience in the warm-air furnace business and was formerly with the Williamson Heater Co., Cincinnati.

Warren Webster & Co., Camden, N. J., announce the appointment of S. E. Vance as Washington district manager, with offices at 301 Southern Building, 15th and H Streets, N. W., Washington, D. C.

Kellogg-Mackay Co., Chicago, Ill., has opened a new showroom in Minneapolis, Minn.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces that all the property as a going business concern of The Westinghouse Machine Company was, on June 15, 1917, consolidated and merged into the Westinghouse Electric & Mfg. Company and will hereafter be operated as a part of the Westinghouse Electric & Mfg. Company which has taken over all contracts, has acquired all current accounts and is prepared to meet all outstanding obligations of the Machine company.

International Heater Co., Utica, N. Y., has opened a branch warehouse at Nashua, N. H., where a full stock will be carried of International steam and hot water boilers, hot water supply boilers, warm air furnaces, one-pipe heaters and combination heaters. C. A. Voter, who has represented the company for many years in that section, is in charge. The new branch is located at 3 Middle Street.

Federal Radiator Co., New Castle, Pa., it is reported, has received an order for 150 hot water radiators for use in the government's army cantonment building.

If You Have Not a Set of Our Catalogs, Get It Today

It is more than a catalog —it is a text book on Instruments for Indicating and Reading Pressure, Vacuum Draft, Temperature, etc.

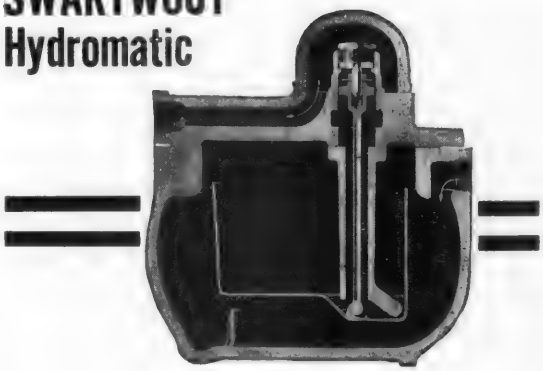
Write for Special Catalog Set HV Today

The
Schaeffer & Budenberg
Mfg. Co.
BROOKLYN, N. Y.

Chicago Pittsburgh Washington
St. Louis Philadelphia Los Angeles

Also many other Allied Instruments, Gauge Boards and Complete Equipment

SWARTWOUT
Hydromatic



IF you want the Steam Trap whose life of service is insured by the inherent principle of intermittent discharge; by a design calling for the use of only 2 moving parts; by a monel-metal, interchangeable construction of valve and seat—

get the SWARTWOUT HYDROMATIC

Send for Bulletin 207-A

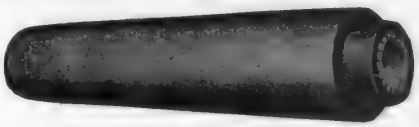
The OHIO BLOWER CO.
5124 Perkins Ave. Cleveland, Ohio

MANUFACTURERS OF
Equipment and Supplies
FOR
Central Station Heating Plants

Copper Diaphragm Expansion Joints, Slip Joints, Anchor Crosses, Line Anchors, Collars, Manhole-Curbs, Pipe Guides, and The Detroit Condensation Meter

THE DETROIT FEED WATER METER
Central Station Steam Co., Detroit, Mich.

STANDARD
Steam Pipe Casing



For Insulating Underground Steam Pipe. Tin Lined, or Unlined.

Every salesman has his argument in order to sell the product he represents. Listen to our argument, be the judge, and you will find same not theoretical but practical, and from actual experience.

When you cover your steam line with our make of casing you have the assurance that the line will be constructed so that no heat will escape, and will be water tight as well, with ample space for air chamber.

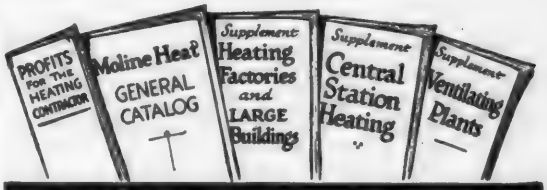
Should occasion arise that it is necessary to get at the steam pipe, our covering CAN BE TAKEN APART WITHOUT DESTROYING THE STAVES in the sections of casing, and the same casing can be used again. LET US EXPLAIN HOW.

If your line runs in different branches we will build the casing in exact lengths so that you will not have to cut any sections, which means no waste or extra expense to you.

Our method of building covering will be to your interest. Our product is right, attention prompt, and prices low.

SEND FOR BOOKLET

Standard Wood Pipe Co.
WILLIAMSPORT, PA.



THESE VALUABLE BOOKS *FREE!*

Each one is worth big money to you. Every heating contractor should have them. They cover all the latest money-making ideas in figuring and installing steam heat—hot water heat—vapor heat—and vacuum systems.

These books will help you to land more orders and increase your profit on every job. Write for them at once. They are absolutely ***FREE!***

Moline Illinois

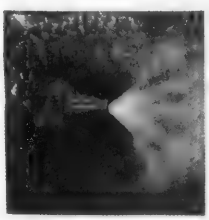
FOOD PRODUCTS

should be produced under ideal atmospheric conditions in order that the product be of the best quality.

Uniformity in results—the reduction in possible variation in quality—the increased efficiency of help, can be largely effected by the installation of a

Braemer Air Conditioning Apparatus

Air Purifying — Humidifying — Low Temperature Drying — Industrial
Air Cooling — Dehumidifying — High Temperature Drying — Ventilation
Dust Removal — Reclamation



Spray Nozzle in Operation

Braemer Air Conditioning Corporation

411 Lafayette Building
PHILADELPHIA, PA.

New York Chicago
Cleveland Cincinnati Indianapolis St. Louis Milwaukee Kansas City

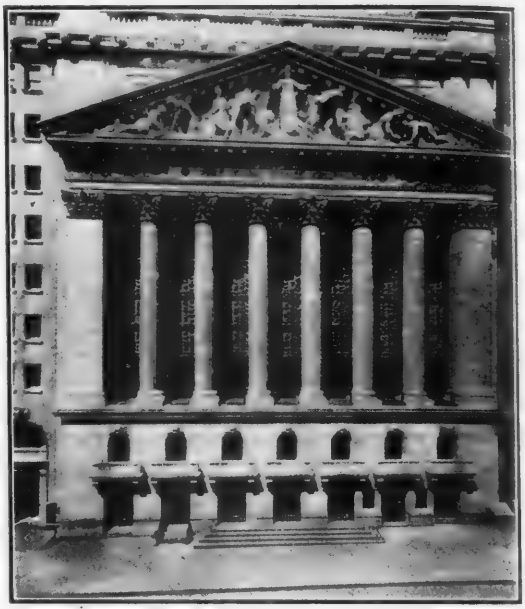
Kewanee Boiler Co., Kewanee, Ill., notified its employees last January that they would receive a bonus of 10% on their regular wages or salaries if they worked 90% of the time during 1917. The favorable business showing made for the first half of the year has induced the company to apply the promised bonus to the half year period. During the balance of the year the bonus will be made a part of the regular weekly pay.

Carrier Engineering Corporation, New York, has appointed George G. Schmidt in charge of its steam heating department. Mr. Schmidt was formerly with the Donnelly Positive Differential System Company, and is well-known to the trade, having served for several years as secretary of the New York School of Heating and Ventilation.

American Pressweld Radiator Corporation, Detroit, Mich., has taken over a building 150 × 220 ft., directly opposite its main plant, to give additional capacity required by the company's increasing business. The new building will be utilized for welding, assembling and testing radiators. The management reports that the plant is working to full capacity.

Kroeschell Bros. Co., Chicago, Ill., has moved to larger quarters at 460 West Erie Street. The company's former address was 440 West Erie Street.

H. Belfield Co., Philadelphia, Pa., manu-



NEW YORK STOCK EXCHANGE

The Carbondale refrigerating plant in this building is the first large plant of its kind installed in the United States. It is used principally for cooling the air in the Board Room, and is capable of maintaining a temperature of 10 degrees below that of the outside air in the hottest Summer weather. About 300 tons of refrigerating effect is required to accomplish this work. These machines are operated exclusively on exhaust steam, under a back pressure of one to three pounds taken from the electric engines.

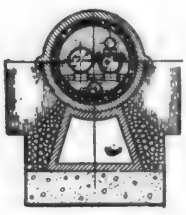
It is without doubt, the most economical refrigerating plant in the world. 300 tons of refrigerating effect being produced with an expenditure of about two tons of coal daily, that being required for the circulating pumps.

The Carbondale Machine Co.
CARBONDALE, PA.
New York Philadelphia Pittsburgh Chicago
Baltimore New Orleans

Air Conditioning

never involves too complex a problem if you avail yourself of our advice

Carrier
Engineering Corporation
39 Cortlandt St., New York
Boston Philadelphia Buffalo Chicago



RIC-WIL METHOD
OF
Insulating Underground Steam and Hot Water Pipes
Send for Catalogue
THE RIC-WIL COMPANY
CLEVELAND

Fill Up Our Soldiers' Pipes

America's fighting men need tobacco to make trench life a little more comfortable. Here's a chance to treat the boys at the front.

"Our Boys in France Tobacco Fund" has been organized to furnish "smokes" for the American soldiers and sailors in active service.

All labor and administrative expenses are contributed so that every cent you give goes to pay for tobacco, which is purchased in large quantities at a low price.

One dollar buys four packages of tobacco and sends them to France. Each package, costing twenty-five cents, has a retail value of forty-five cents and keeps a man in "smokes" for a week. Every dollar sent to "Our Boys in France Tobacco Fund" buys a bundle of tobacco that would cost $1.80 at your cigar store.

In every package is a post card addressed to a contributor to the tobacco fund. In accepting the package, the soldier or sailor agrees to send on the card a message to his benefactor in the United States. According to the plan, every person who gives a quarter gets his receipt from a fighting man in France.

The work of this fund is approved by the Secretary of War and the Secretary of the Navy.

Send as many dollars as you can spare. Write your name and address clearly.

"Our Boys In France Tobacco Fund"
25 West 44th Street
New York City

Too Hot? Too Cold?

Use a Sarco Temperature Regulator and get your conditions right

Sarco Temperature Regulator for Tanks, Containers, etc.

If you want to keep your product at any temperature between freezing point and 325 deg. F., you can install a Sarco Regulator and control your heating or cooling medium so as to use just as much or as little as you need. There is no waste and your product will be better and more reliable because produced under standardized conditions.

The Sarco Temperature Regulator is a tube containing oil. When this oil heats, it expands; when it cools, it contracts. This expansion and contraction becomes effective on a balanced valve which opens and closes, thus feeding or checking the heating or cooling medium so as to keep the temperature where you want it. No hand valve can be operated so sensitively. **The SARCO is a thermometer plus a hand.** It works twenty-four hours a day, is self-contained and supplies its own motive power.

You can have one on 30 days' trial. Ask for a pamphlet on Sarco Temperature Control and say whether you want to control a water, gas or steam supply.

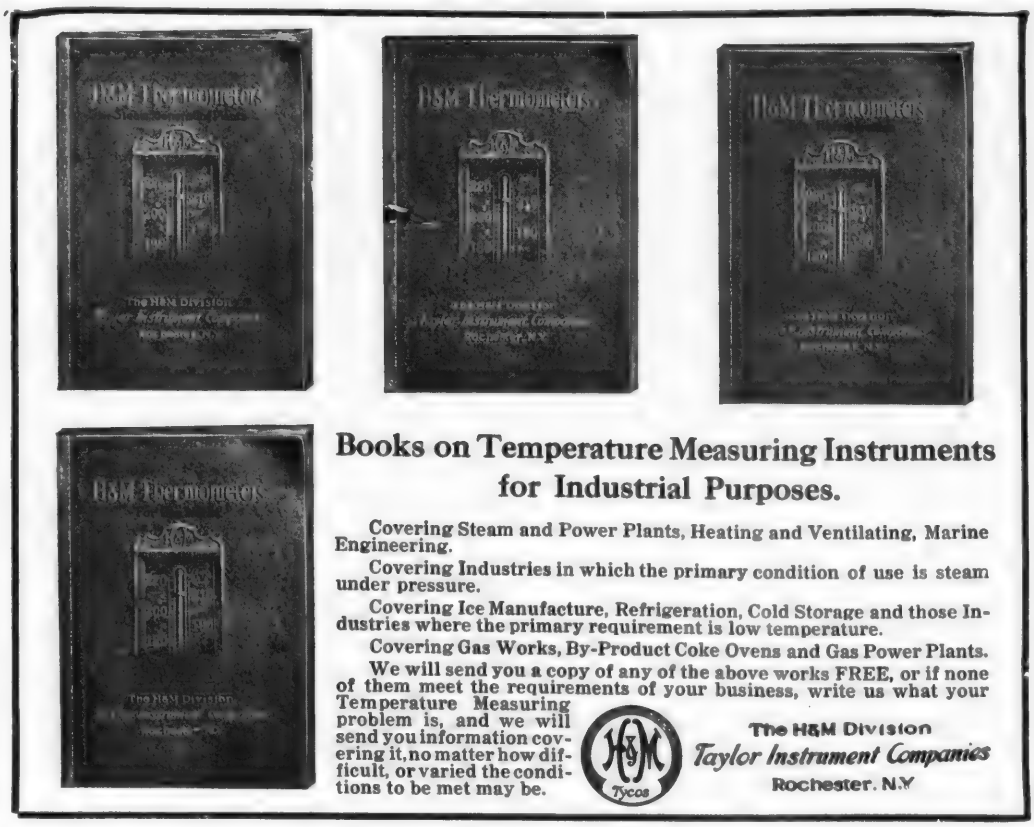
Sarco Company, Inc.
Woolworth Building
New York

Buffalo Philadelphia Detroit Chicago

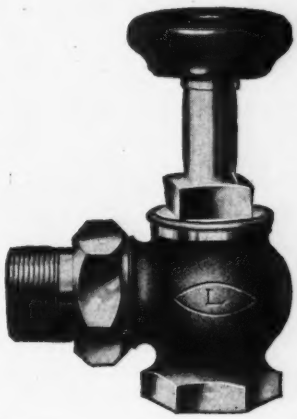
facturer of steam fittings and other supplies, is planning the construction of a new plant at 19th, 20th and Cambria Streets. The proposed buildings include a five-story reinforced concrete building 100 × 280 ft., a one-story building of the same dimensions, a one-story foundry 100 × 275 ft., and a power plant.

Buffalo Forge Co., Buffalo, N. Y., announces that the United States District Court has recently sustained the Carrier patent on the company's dewpoint and humidity control. Suit was brought against the City of Buffalo and Thomas & Smith, Inc., contractors on two installations which the Buffalo Forge Company claimed to be infringements on the Carrier patent. The claims cover the automatic regulation of humidity, so as to maintain a constant dew point or saturated temperature by means of bringing air into intimate contact with water heated above the temperature of the water to accomplish the desired result, *i.e.*, the water temperature is variable so as to produce a constant saturated temperature of the outgoing air. The court holds that it is not essential that this water should be sprayed into the air, since the defendants' infringements consisted of a tank of hot water which, overflowing, mingled with the unheated water from the spray nozzles thereby producing the intimate mixture which our patent covers. The Buffalo Forge Company considers that heated spray water at a variable temperature, which is controlled by thermostat at the bottom of the eliminator is an infringement, but a thermostat submerged in the middle of a tank does not infringe as this would tend to keep a constant temperature of the spray water at a variable temperature with a *constant water temperature* the air temperature would vary from time to time—and humidity control could only be obtained with an additional thermostat.

American Radiator Co., Chicago, Ill., has declared a regular quarterly dividend of 1¾% on its preferred stock, payable August 15; also a regular quarterly dividend of 3% on its common stock, payable September 29.


Books on Temperature Measuring Instruments for Industrial Purposes.
Covering Steam and Power Plants, Heating and Ventilating, Marine Engineering.
Covering Industries in which the primary condition of use is steam under pressure.
Covering Ice Manufacture, Refrigeration, Cold Storage and those Industries where the primary requirement is low temperature.
Covering Gas Works, By-Product Coke Ovens and Gas Power Plants.
We will send you a copy of any of the above works FREE, or if none of them meet the requirements of your business, write us what your Temperature Measuring problem is, and we will send you information covering it, no matter how difficult, or varied the conditions to be met may be.
H&M
Tycos
The H&M Division
Taylor Instrument Companies
Rochester, N.Y.

Your Assurance of Satisfaction



The assurance of real satisfaction on completing a heating contract is in having dependable valves.

You can only be assured of this satisfaction by using a valve that has back of it a record of satisfactory performance.

For nine years our sole aim has been to place in your hands a valve that will enable you to guarantee a perfect installation and uphold your reputation for honest work.

The Lavigne Principle

as embodied in our Packless Quick-Opening Steam Radiator Valves represents the following proven claims:—

The impossibility of leaks, either of air, water or steam.
The speed with which they can be completely opened or completely closed.
The freedom from mechanical troubles.
The striking beauty and graceful appearance of the finished product.

Remember the Name

LAVIGNE MANUFACTURING COMPANY, Detroit, Michigan

Cover Your Underground Steam Pipes

with our "STANDARD STEAM PIPE CASING." It is by far the most efficient of any insulation on the market—simple to install—durable, and it is water-proof because it does not expand or contract.

Our business is greater this year than ever before, so place your orders early.

WRITE FOR PRICES AND SPECIAL BULLETIN No. 113-H

AMERICAN DISTRICT STEAM COMPANY

General Offices and Works:
NORTH TONAWANDA, N. Y.

NEW YORK CHICAGO SEATTLE

New Incorporations.

Palmyra Light, Heat & Power Co., Palmyra, Ill., capital $10,000. Incorporators: Lewis M. King, Clarence W. King and Nellie G. King.

Mutual Heating and Lighting Co., Toledo, O., capital $50,000. Incorporators: William J. Bisbesheimer, Marvin M. Koos, W. L. Vail, H. A. Pollox and P. F. Parrott.

East Fulton Hardware, Heating and Plumbing Co., Grand Rapids, Mich., capital $20,000.

Sunray Solar Heater Co., Tampa, Fla., capital $50,000, to manufacture and install boilers, tanks and reservoirs; also to engage in pipe fitting and plumbing. President, E. Cunningham; vice-president, J. H. Fessenden; secretary, W. J. Regar; directors, E. Cunningham, J. H. Fessenden, W. J. Regar, C. G. Mullen and D. B. McKay.

New Mfg. Co., Ltd., Ottawa, Ont., capital $45,000, to manufacture heating devices. Incorporators: Thomas A. Beament. Alan K. Armstrong, Robert J. Smith and others.

Ralph E. Weeks Co., Scranton, Pa., capital $200,000, to manufacture heating and plumbing supplies. Incorporators: Ralph E. Weeks, Martin F. Corcoran and Arthur W. Close.

Piedmont Heating & Plumbing Co., Burlington, N. C., capital $25,000, to conduct a contracting business in heating and plumbing work.

Contracts Awarded.

Appling-Griggs Co., Portland, Ore., heating and plumbing addition to Administration Building of Lewiston State Normal School, for $16,379. Other bidders were: Peterson Plumbing & Heating Co., $19,177; C. Hahn, Lewiston, $18,530; Arnold-Evans Co., Spokane, $18,358, and Witter-Fisher Co., Moscow, $18,244.

Englehart Heating Co., Atlanta, Ga., heating plant of the Chamberlin-Johnson-Dubose Company; also new Peachtree Arcade.

Northern Heating Co., South Bend, Ind., heating and ventilating Sample Street School for $33,760.

W. B. Van Sickle, Cleveland, O., is completing the heating installation in the new Euclid Building which has been remodeled from the old Brown Building, which stood empty for so many years in the heart of Cleveland's downtown business district. More than 11,000 sq. ft. of direct radiation is being installed. Mr. Van Sickle states that the threatened gas shortage predicted for next winter has brought him many contracts for auxiliary heating systems in residences, garages and stores.

J. J. Hurley & Co., Boston, Mass., making alterations and additions to the steam piping of the power plant at the Long Island Hospital for $32,975. Other bidders were: Lynch & Woodward, $33,684; Huey Bros. Co., Inc., $34,400; Laskey & McMurrer, $36,418.

Lowell, Mass.—Bids were received as follows for the heating and ventilation of the addition to the Bartlett School building in Lowell: Carroll Bros., $27,448; Thomas E. O'Day Co., $29,868; L. Costello & Co., $29,630; John A. Cotter, $27,930; J. F. McMahon & Co., $29,343; Hobson & Lawler Co., $28,225; John J. Mullaney, $29,943; Farrell & Conaton, $28,410; H. H. Wilder & Co., $27,860.

WANTED.

Wanted—Heating engineer. Permanent position, with exceptional opportunities, for experienced and competent man. State experience and salary. Hersh & Brother, Allentown, Pa.

Wanted with heating and ventilating contractor, high class estimator who thoroughly understands his business. Good opportunity, steady employment for right man. State experience, age, salary and references. Address, Willing, Box 20, care of Heating and Ventilating Magazine.

Wanted—Qualified consulting engineers wanted to submit record of training and experience and join the A. A. E. to complete the list for "Service to the Public" bureau. American Association of Engineers, National Co-operative Business Organization, 29 South La Salle St., Chicago, Ill.

FOR SALE.

For Sale.—One No. 6 single-width, single-inlet, modified squirrel-cage fan, rated capacity 186 R.P.M. of 61,700 C.F.M. at 1¼-in. static; B.H.P. 25.2. The fan was in use only a few months, gave perfect satisfaction, but we required larger capacity. It is in perfect condition; can be shipped immediately. Price $400.00 F.O.B. cars Chicago. The Moses Rothschild Co., 332 Postal Telegraph Building, Chicago, Ill.

FOR SALE

SECOND HAND BLOWER, CHEAP

56 inches in diameter; Six 14x32 inch blades; outlet 26x33 inches. Complete, with Driving Pulley.

NEW ARCADE COMPANY, Washington, D. C.

The Heating and Ventilating Magazine

VOL. XIV. NO. 10

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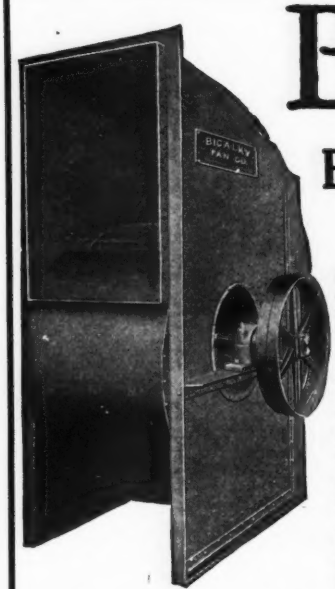

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